The

Electrical Review

VOL. CVI. MARCH 14, 1930. No. 2729.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman and Joint Managing Director: G. H. ALABASTER, Assoc.I.E.E.

Technical Editor: G. O. BRETTELLE, M.I.E.E.

Joint Managing Director: E. A. GATEHOUSE, M.I.E.E., A.M.Inst.C.E.

Commercial Editor: A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 8871 (6 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Contents:

	PAGE
Standardisation	477
Increased Cost of Coal	478
Portishead	478
The Standardisation of Supply	478
Patriotism and Publicity	478
The British Electrical Industry during the next Decade, by J. A. Crabtree *(illus.)*	479
The British Industries Fair, Birmingham	481
Electricity Supply at Bristol *(illus.)*	482
Electricity for the Home, by E. H. W. Banner	488
The Leipzig Spring Fair *(illus.)*	489
Talking Film Apparatus *(illus.)*	490
The B.E.S.A. Dinner	491
Business and Industrial Notes	492
Lighting and Power Notes	497
Tramway and Railway Notes	498
Telegraph and Telephone Notes	499
Radio Notes	499
Contract Information	500
Forthcoming Events	501
Notes	502
Our Personal Column	505
Financial Section—	
New Companies Registered	505
Official Returns of Electrical Companies	506
Financial Section—*contd.*	
City Notes	507
Stocks and Shares	509
Electrical Exports of the United States	511
Electric Arc-furnace Regulation *(illus.)*	513
A Floodlighting Installation *(illus.)*	514
New Electrical Devices, Fittings, and Plant *(illus.)*	515
A Theatre Lighting Scheme *(illus.)*	517
Communication and Power Engineering, by Col. Sir T. F. Purves	518
Piezo-electric Crystals, by H. J. Lucas	519
Diesel-Electric Generators, by W. S. Burn	520
Watt-hour Meter Accuracy, by A. E. Moore and W. T. Slater	521
Parliamentary News	522
Legal	522
Correspondence—	
Motor Users and the Frequency Change	522
High Power Arc Rectifiers	522
The Efficiency of Conversion	523
The City and Guilds Examinations	523
Relative Costs of Electricity and Gas	523
Published Specifications	523
Trade Mark Applications	523
New Work for Contractors	524

Standardisation.

THE presence of the Duke of York at the banquet given by the British Engineering Standards Association last week to celebrate the granting of its Royal Charter may be said to have set the seal of authority on the principle of standardisation.

Let us be quite clear, however, as to the precise meaning we attach to that word, since—as His Royal Highness implied—it must not be used, in the present connection, to mean interference with initiative and imagination in design. There is, however, no ground to fear that the kind of standardisation for which the Association labours can have this result. The principle followed, as enunciated by Mr. Maurice Wilson, is that no specification shall be issued unless all parties are agreed as to its desirability. This principle surely represents the highest grade of individualism, the point at which co-operation is added to (not substituted for) the work of each of the component members of a group; it represents the true democratic idea that agreement between individuals is better than legislation imposed from without.

But for the work of the B.E.S.A. it is probable that the practical difficulties of non-standardisation would, sooner or later, have rendered such legislation necessary. The chaos due to the multitude of patterns in existence in every branch of engineering at the beginning of the century, which was referred to by Mr. H. J. Skelton (hailed by Mr. Llewelyn Atkinson as the "father of standardisation in Great Britain") was possibly not without its compensations, since it provided a greater field from which synthetic standards could be built up when experience was more mature. Most of the divergences from patterns were, no doubt, due to mere personal idiosyncracies and were of doubtful value; yet the danger of inhibiting a creative diversity made it necessary to suffer them, if not gladly. Nowadays, no one would dispute the supreme advantage of standard screw-threads, and it would be difficult to conceive any departure from normal that would produce sufficient advantages to justify itself, but it must be remembered that the threads now in use were only those agreed to be the most suitable among the many patterns produced by isolated works.

There exists, however, with some people a belief that standardisation is incompatible with individuality, but the contradistinction is, we think, invalid. To standardise details of material is not to reduce to one level each individual working in the material; rather is the individual freed from the trammels of sorting out details of less importance and so enabled to find a wider scope for his energy. True individuality—we prefer the word to "personality," which is so often abused as a window-dressed substitute—is a manifestation of the man himself and is shown in his will to surmount obstacles; it is not to be suppressed by conforming to basic principles of a material nature which experience proves the most suitable. Indeed, in the co-operative spirit that this implies may be found the most fruitful outlet for individuality.

Increased Cost of Coal.

In a letter to *The Times*, Lieut.-Colonel W. A. Vignoles (director of E.D.A.) has exposed the fallacy that, because the cost of coal is only a small fraction of the selling price of electricity to small lighting consumers, the effect of even a substantial increase in its cost, such as 40 per cent., would be negligible, as had been suggested in an earlier communication from Mr. F. R. West, M.P. While this might be true with regard to the small proportion of electricity sold at prices in the neighbourhood of 6d. per kWh, it must be recollected that the average price of electricity sold at the present time must be under 1.5d. per kWh. Taking a two-part tariff with a secondary charge of 0.5d. per kWh based on a coal cost of 0.25d. per kWh sold at 18s. per ton, an increase of 40 per cent. would represent an increased cost of electricity of 20 per cent., which would no doubt have to be passed on to the consumer, thus making it still more difficult to compete with the domestic coal fire. About 65 per cent. of the output of generating stations in 1927-28 was sold for industrial power at less than 1d. per kWh—in many cases at low margins of profit making it necessary to adjust prices by means of a "coal clause." Here, again, the purchaser of power from an electricity undertaking would be penalised. It may be said that but for the sale of the output of power stations at low prices, the present large scale methods of generation would not have been possible and that the prices charged for lighting to the small consumer would be higher still. If the progress in the sale of low-priced energy is to be thwarted by the possibility of unfair discrimination in coal prices against statutory undertakings, the small consumers, who are numerous even if their consumption of electricity be small, will not ultimately escape the effects of such a policy.

Lieut.-Col. Vignoles introduced a striking illustration of the effect of an increase in the cost of coal on the financial position. A 40 per cent. increase would cost the industry the sum of £2,880,000—an amount larger than the total amount paid by the supply companies as dividends on their ordinary share capital. Even if the shareholders in these companies were content to accept a lower return on their investments, there still remain the municipalities which must meet their interest and redemption charges. Often in the latter case, as Lieut.-Col. Vignoles pointed out, the only way of meeting the situation would be by increasing charges or making levies upon the local rates.

Portishead.

Bristol was early in the field of electricity supply, as its first Order was taken out in 1883—only one year after the passing of the first general Act. Under the direction of Mr. H. Faraday Proctor it was among the first undertakings to install steam turbines at its Avonbank station (later to be known as Feeder Road) and now, still under Mr. Faraday Proctor's guidance, it is a pioneer in the use of very large steam turbines in this country. The 50,000-kW set now under construction is exceeded in capacity only by those ordered for Battersea; it is required to supplement the output of two "small" sets, each of a capacity of 20,000 kW only recently installed at Portishead power station, which we describe elsewhere in this issue.

Portishead was designed, not only with a view to the requirements of the nearby city, but also as a capital station under the national scheme. Under the proposals of the Electricity Commissioners it will be extended to 240,000 kW within the next 13 years, but it is capable of ultimate extension to 360,000 kW. The most striking feature about the Portishead station is the arrangement of the circulating water system rendered necessary by the magnitude of the tidal variation, which is over 51 ft. This has introduced difficulties of a kind not, we believe, encountered elsewhere in Great Britain. Portishead is the only large station to be put into operation recently without an inauguration ceremony.

The Standardisation of Supply.

In our "Business Notes" to-day we report the passing of a resolution by the Council of the Electrical Contractors' Association deploring the slow progress which is being made with the standardisation of supply pressures, and urging the I.E.E. to call a conference representing the various branches of the industry concerned with a view to speeding up the process.

The existing medley of systems, voltages and frequencies is not merely very inconvenient to manufacturers, wholesalers, and dealers alike—it is also considerably expensive to the user of electrical appliances for it is he who has to pay the piper. Thus there is a serious restriction upon the sale of appliances which again reacts upwards to the manufacturer. It is a most vicious circle: only by production in large quantities can the prices of appliances be reduced. This means that the existing price must not be prohibitive so that the movement can be given a start. Yet the cost of catering for a variety of supply systems adds considerably to the production cost and prevents the lowering of the selling price to a really attractive figure.

Given standard voltages, the manufacturer's expenses would be far less and this saving would be enhanced by the reduction in the wholesaler's expenses. Discounts would be calculated on smaller bases and the resultant effect upon the selling price would be considerable. Thousands more would find electrical appliances within their reach and would hasten to buy them. This, as E.D.A. has so often pointed out, means the sale of more electricity and consequently more generating plant, more cables, transformers, switchgear, and everything electrical. We realise that the Commissioners *are* working at this problem—our "Lighting and Power Notes" testify weekly to the gradual changing over of systems and voltages. But we certainly believe that with a little more goodwill, co-operation and foresight on the part of electricity supply authorities, the way could be made easier and the Commissioners encouraged to proceed at a much greater rate with this most important part of their duties.

Patriotism and Publicity.

Sir Felix Pole's observations on the electrical industry are of more than usual interest in that he has not been one of us long enough to accept without question the inevitableness of existing conditions.

At the Batti-Wallah's luncheon last week he referred to the anomaly that while orders were more plentiful than they have ever been, the prices received were too low for sound finance. He expressed the belief that if methods of salesmanship were equal to design and workmanship the outlook would be far more healthy, and that the same need for development of service methods applied to the supply section of the industry. Sir Felix summarised the situation by pointing to the two essentials of salvation; patriotism towards the industry and publicity. In short, the views of Sir Felix provide independent confirmation of those held by other eminent authorities in the industry—views which we ourselves have consistently upheld.

The British Electrical Industry during the next Decade.

The author foretells increased competition in all sections of the industry, and deals with some effects of the Electricity (Supply) Act, 1926. He foresees trouble for the Electrical Contractor, whose salvation lies in giving better service, and holds that the Wholesaler will suffer most of all. Many manufacturers will disappear. The influence of American capital in the industry and of American trade competition overseas is discussed and British works are advised to profit from American experience in International Management.

By JOHN A. CRABTREE.

WE, in the electrical industry, are fortunate in the excitements of the times in which we are living. There has never been a period in our history so pregnant with the possibilities of change and new development. Our difficulty is, that new events take place so rapidly, that things seem to be altering overnight. Design, technique, organisation, are all in a state of flux, and no one can as yet see clearly what will crystallise therefrom.

We are also faced with the fact that commodity values throughout the whole world are going through a long cycle of declining prices, consequent particularly upon the increasing use of a gold standard as the basis for the currencies of the world. All industrial countries have before them a most difficult period (which may last for our lifetime) of slowly but inevitably falling prices. The electrical industry in this country has, up to the present, not felt the full blast of this influence, but I am satisfied that the next few years will see increased competition in every section of the industry, in which all the component groups: manufacturers, wholesalers, and contractors, will one and all suffer alike.

Bullock] *[Walsall.*

Mr. John A. Crabtree.
Managing Director of J. A. Crabtree & Co., Ltd.

The electrical industry is essentially one which sells a service, and the stress of declining prices does not operate in producing the same article at a lower price, but in *producing the same service at a lower price.* For example, the prices of electric motors have fallen very considerably during the last few years, but the fall in price is not so marked in any individual motor, as in the price of what was offered five years ago, as (say) a 25-h.p. motor, and what is sold to-day to meet the same demand.

In some branches of the industry, this tendency is little less than adulteration. The electrical industry sells many of its goods labelled on the machine, or on the box, with the standard of its service (amperes and volts; kilowatts, and the like), and it is quite frequent to find products marketed with labels claiming standards of service which it is doubtful if they can fulfil. In so meeting this stress of price, the electrical industry is in danger of adulterating its goods in the same way that the old-fashioned grocer mixed sand with his sugar, or weighed the wrapper with his tea. These things are not unique to our industry, for they are operating to some degree in all industries, but it is only within the last few years that they have been acute in the electrical industry. Nowhere have they gone to such extremes as in the United States, where a piece of brass foil, and papier-mâché, prettily labelled, will sell as a switch, and an india-rubber jujube might pass for a fuse.

* * * *

Let me deal with the 1926 Electricity Act. The creation of a national grid fed by such diverse undertakings as public stock companies on the one hand, and by socialised supply authorities on the other, is going to lead to a very piquant situation in the near future. At which end lies the tail, and who will wag the tail, is, as yet, by no means clear. One thing, however, is very definite. The Act has truncated the responsibilities of many supply engineers, and by removing their responsibility for generation, will emphasise the importance of distribution and salesmanship. We shall find that the reputation of the local supply engineer will no longer be built upon his efficiency as an engineer, but upon his qualifications as a salesman. The realisation of this is growing in the minds of many engineers, who are developing their undertakings more as a competitive business undertaking, than as an engineer's job. I can quite understand how such a change in responsibility must have given a severe mental jolt to many engineers. Nevertheless, the trend is unmistakable and inevitable, and I am convinced that success will come to those men

who face the fact that their primary responsibility is no longer the low cost of generation or the relief of rates, but the increasing sale of electrical energy. It may take ten years for this realisation to permeate the supply engineers as a whole, and by that date we shall see the acute development of a serious problem, to which, at the moment, no solution is apparent. The whole of the inter-trading arrangements with and between the contractor, wholesaler, and manufacturer, are likely to go into the melting pot. I do not anticipate that the electrical contractor will be reduced to the status of the gasfitter and plumber, but he must face the fact that the economic tendency at the moment, consequent upon the 1926 Act, is toward his definite elimination, except in so far as he is to be allowed to exist, on the sufferance of the municipal authorities and the private supply companies.

Fundamentally, the supply engineer and the contractor are drifting into direct opposition and competition, so far as installation work is concerned, and at the moment the supply engineer has the tactical advantage. The growing issue is in no way a personal one. Each individual contractor and supply engineer is in himself helpless in the face of economic and political influences. I am satisfied from conversations that I have had with many supply engineers, that they as individuals do not desire the elimination of the electrical contractor, but the 1926 Act has conferred great power upon the supply authorities, and the existence of the electrical contractor is in the main dependent upon his organised power to maintain his independence and even his existence. In addition to this, however, the salvation of the contractor lies also in the giving of such distinctive service as can rarely be given by the larger and more dislocated organisation of a public supply authority. It is by the creation of business goodwill, and by closely knit trade organisation that the contractor will go far to hold his own.

To the extent to which the contractor suffers, so also will the wholesaler, who has his own peculiar problems to face. I sometimes feel that the position of the wholesaler is the most difficult of all, and he will sooner or later find it necessary to tighten up his trade organisations. He may even have to surrender his individual freedom for the safety which comes from operating as a body. So far as the manufacturer is concerned, he, again, is going to have his own difficulties. The stress of competition alone is going to have a fundamental effect upon policy and development, and we shall probably find in ten years' time, that half of the firms in existence to-day have gone out of business, either by absorption into larger organisations, or through implacable competition.

Not only manufacturers, but also every section of the trade is intimately concerned with the great developments that are taking place, through the increased control by American interests in the British electrical industry. It is very interesting to search the B.E.A.M.A. publication on " Combines in the Electrical Industry " for information upon the interlocking between British concerns and foreign capital, and find nothing of importance. This is the more noticeable when one reads the considerable data upon the interlocking of interests in other markets, as, for example, in Germany and France. One cannot help but feel that the salient facts regarding British industry have accidentally been overlooked.

The study of the B.E.A.M.A. report, however, when supplemented with other information, emphasises the importance of American capital in the electrical industry throughout the world. It is difficult to find any parallel in any other field of industry, with the possible exception of motors, oil, or matches. We find the American G.E. Company, for example, operating extensively not merely in America, but in all the British Dominions, in the leading countries on the Continent, and, not least, within some of the largest electrical concerns in this country. This is largely a result of the war, and from the disturbance of the currencies and liquidation of war debts consequent upon the war.

It has to be faced as a basic fact, and I have no patience with those who spend their time reviling this growth of American interest and control. At the same time, all our policy and outlook in the British electrical industry must be governed by this fact, although it may be too early as yet to foresee how it will operate. I have my doubts as to whether it will ultimately bring the benefits to the American interests which our American friends expect, and here I refer not merely to the electrical industry, but to the whole policy of American control as at present being expressed. The position is, that America as a nation is ceasing to export manufactured goods, and is tending to export her factories. Whatever profit those factories make must in turn remain overseas, and be re-invested in more and more factories. Ultimately, America may find that she has made a serious miscalculation, but at present that end is too far distant to be a matter for immediate consideration. For the moment, therefore, the world has to recognise this infiltration of American capital and control into the world's industries, and that this infiltration is going to have a very profound effect during the next decade. We have already seen the desperate struggles of certain British companies in their endeavour to maintain their independence, and I am satisfied that no public company, whose shares are freely quoted on 'change, can ultimately maintain its freedom if America is interested, and desires " co-operation " in the modern financier's meaning of the word.

This problem is, therefore, added to the other problems of the English manufacturer, whose position will become increasingly difficult in the near future, and particularly so in the period which will immediately follow the completion of the " All-British Grid Scheme." No British manufacturer responsible for any industrial business of repute can therefore afford to neglect the study of management and policy as being developed under American control. America is conducting a great experiment—probably the greatest experiment that the world of business has ever seen. It remains to be seen whether she has as yet solved those problems of management and policy which are inevitable in these international ramifications. I know of no organisation (except one, which cannot be considered as a business organisation in the current sense of the term) which has established any basis of international management to withstand the test of time. All organisations of this type have as yet had a very short life, and the extent of their stability and ultimate efficiency is dependent upon racial and psychological factors. The men responsible for the higher management of such concerns are faced with new problems which demand a distinct technique if permanence and efficiency are to be secured. I do not believe that such a technique has as yet been evolved, and the world-wide experiments which are being tried out to that end are of intense interest and fundamental importance to the future study of control and management. Equally so, have they great significance to the British electrical industry. It may be that history may ultimately agree that the greatest contribution of America to civilisation has been her study of international management. Again, history may decide otherwise. Time alone can tell.

Unemployment in the United States.

The New York correspondent of the *Daily Telegraph* states that senators of the United States are complaining that the facts regarding unemployment are being concealed. They allege that the suppression of demonstrations by the workless in various parts of the country, on the ground that they are organised by Communists, is a " red herring " drawn across the trail. On all sides there is a demand to know on Federal authority how many people are without work, but no satisfactory answer is forthcoming. Senator Couzens, of Michigan, placed the total on January 1st at over 6,000,000, and this figure is said to coincide roughly with the popular estimate. *The Times* gives the official estimate at 3,000,000. " The number considered in relation to a population of about 125 millions, may not be large, but serious students are convinced that it is becoming slowly but steadily larger."

The British Industries Fair, Birmingham.

Some Personal Electrical Reflections: Critical and Otherwise.

As many of our readers well know, we (the Electrical Review) occupied a stand this year in the Electrical Section of the British Industries Fair at Birmingham. We hardly know whether this procedure has gained for us many additional readers, but we have at least been able to get far more closely into the spirit of the Fair than has ever before been possible. Speaking electrically, we think we may safely say that the Fair has this year been a success from the point of view of the exhibitors. That is to say, we have had far fewer expressions of dissatisfaction this year than in the past, and in some cases we have even met with enthusiastic approval.

While no great amount of actual business appears to have been done, inquiries which look like leading to business have been considerable in number. In the main they emanate from home firms. The assumed Colonial or Dominion buyers have been few and far between. The old question of the date is revived every year when the Fair takes place, and we have not found that exhibitors even appear to expect buyers to be present from any of the more distant portions of the Empire. No one can possibly expect visitors from the far-off Dominions to arrive in this country in the middle of February unless some desperate necessity forces them to do so. The question of the date is, however, as already announced, under discussion at the moment by the Committee appointed by the Government, and we will make no further comment upon it.

One aspect of the Fair has apparently impressed quite a number of the exhibitors. They find themselves brought into contact with members of all kinds of other sections of the engineering industry, and, in quite a number of cases, business between firms in different sections has resulted simply because they were brought together under the same roof. When it is considered that the electrical exhibitors do not amount to more than about 12½ per cent. of the total number of exhibitors, it will readily be appreciated that opportunities in this direction are very considerable.

We feel strongly that special efforts must be made in the future to bring the whole of the electrical exhibitors into one section of the building. An effort to this end was made this year, but was not altogether successful. A few non-electrical firms found themselves in the midst of a fairly strong Electrical Section, while quite a number of electrical firms were distributed over other parts of the building. When it is considered that the Birmingham buildings are already a third of a mile long and 250 ft. wide, it will be appreciated that an enormous distance has to be covered if one desires to see the whole of the electrical exhibitors.

As we have already stated, the electrical representation was not by any means complete; many firms connected with the productive side of the industry were not present. From an electrical point of view the buildings at Castle Bromwich, added to as they have been, piece by piece, are not ideal, and we think that the authorities might well devote careful thought to the idea of having a separate Electrical Hall on the lines of that at the Leipzig Fair, which we illustrate in another part of this issue. This would probably form an additional incentive to all electrical exhibitors to take their proper place in the one building.

Certain exhibits which when in motion or operation were exceedingly noisy were permitted in the Electrical Section, and we would strongly suggest that such procedure should not be allowed in future Fairs. It is the merit of most electrical apparatus that it is essentially silent in its operation and the complete silence which would normally be a feature of the Electrical Section should not be interrupted in any way.

While Birmingham would appear to be a suitable centre for electrical, and the majority of engineering, exhibits, there are various directions in which important work is necessary before the Fair organisation can be considered as approaching the efficiency of Leipzig. The larger hotels in Birmingham are always overcrowded at the period of the Fair, with the result that service is none too good. The Fair itself being situated several miles from Birmingham needs vastly better transport facilities. It is within our own experience that on the morning when the Fair opened certain of the 'bus drivers, who were especially detailed for Fair 'buses, did not know where it was. The train service is wretched to a degree and should be considerably augmented and expedited at the rush hours. Little thought seems to have been given to the needs of the exhibitors and their staffs, all of whom have to be at Castle Bromwich when the Fair opens in the morning, and have to leave when the Fair closes at night. Similar grumbles apply to the catering; exhibitors and public are jumbled up together, while the food was not satisfactory for the prices charged and the service was particularly bad at the rush hours.

We think it should be possible to have one or more restaurants set apart entirely for the use of exhibitors and their staffs; probably two restaurants with different prices would meet this requirement. It should be remembered that probably some 3,000 people representing exhibitors are in the building every day and that they have no means of obtaining refreshments other than within the limits of the Fair itself.

The special electrical days, which occurred on the Thursday of each week, were very well attended, members of fifteen or sixteen different well-known electrical associations being present in very fair numbers.

Glasgow Bakery Exhibition.

Electrical machinery is prominent at the Bakers', Grocers', and Allied Trades Exhibition opened at the Kelvin Hall, Glasgow, on March 4th. Among the exhibitors are:—Electrical Refrigerators & Appliances, Ltd., which shows Kelvinator automatic electric refrigerators; Artofex Engineering Works, Ltd., which exhibits an electric working bakery with a two-deck 8 ft. by 4 ft. electric peel oven, electrically-heated tempering tank, &c.; Frigidaire, Ltd., models of refrigerators; the Morton Machine Co., bakery machines; the General Electric Co., Ltd., whose gear is on operation in the working bakery of the Scottish Master Bakers' Association and other exhibits; the Peerless Electrical Manufacturing Co., Ltd., showing electrical cake mixers, &c.; the Hobart Manufacturing Co., Ltd., electrical food-preparing machinery; Mr. P. R. Milne, electric pie machine, &c. The exhibition closes to-morrow (Saturday).

Electricity Supply at Bristol.

An illustrated description of the initial 40,000-kW section of the new capital generating station built by the municipality on the River Severn estuary at Portishead Dock, which is capable of extension to an ultimate capacity of 340,000 kW.

DURING the year ended March, 1929, the Electricity Department of the Corporation of the City and County of Bristol served 32,364 consumers, its output totalling 109,766,240 kWh. Its distribution system comprised 818 miles of underground cable and 282 sub-stations, transforming chambers, &c., the installed generating plant capacity being 49,540 kW.

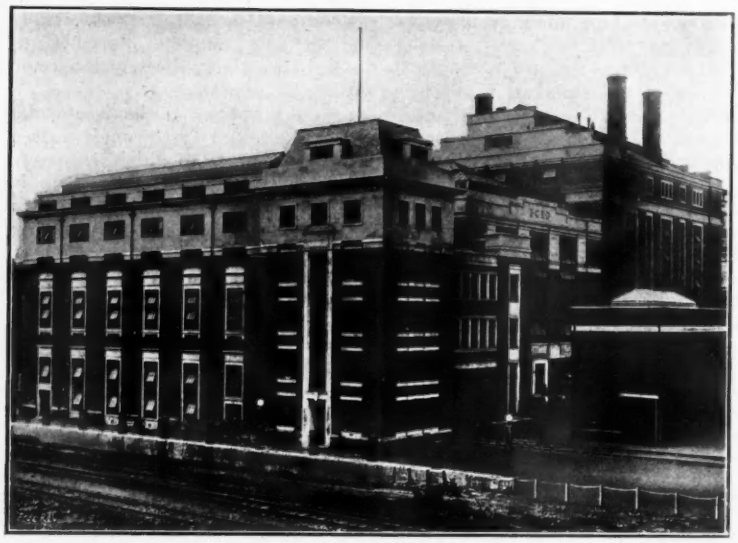


Fig. 1.—Bristol City's New Electricity Station.

The anticipated annual rate of increase of the demand for energy in the undertaking's area of supply is calculated on the average over the past 30 years to be 10 per cent., which figure agrees with the findings of the Weir Committee as applicable to the whole country. On this basis the estimated requirements of the district will necessitate the provision of additional generating plant capacity of approximately 160,000 kW by the year 1938.

Concurrently with the necessity for satisfying the requirements of the Bristol district, the Electricity Commissioners desired a capital station to be built in the western area,* and at their request the chief electrical engineer and manager of the municipal undertaking, Mr. H. Faraday Proctor, M.Inst.C.E., M.I.E.E., formed a committee of engineers operating in the west to select a site between Gloucester and Watchet, Portishead being ultimately chosen. Situated about 500 yards from the River Severn, from which ample condenser-cooling water is available, the 23-acre site is served by the Great Western Railway, which adjoins the station and runs parallel with the Portishead dock, owned by the Bristol City Council and providing an alternative means of transport.

The buildings are divided into a boiler house, turbine room, and l.p. switch house, a separate building accommodating the h.p. switchgear; an administrative block links the two switch houses, which are separated by railway sidings. The buildings stand in tiers down the hillside, being composite structures of steel, concrete, and red brick, dressed with Portland stone.

It will be recalled† that one of the features of the station is the novel arrangement of the condensers, the bottom of the pump pit being 54 ft. below ordinance datum, the condensers at 0.0 datum level, and the vertical-spindle pump motors just below the turbines, well above the highest recorded tide level. The maximum range of tidal variation is 51.25 ft. Four culverts, each of an internal diameter of 7 ft. 6 in., convey water from the River Severn to the station. They are concrete lined with brindle brick, except for a section about 22 ft. long at their foreshore ends, which is constructed as a three-ringed brick barrel within a stiffened steel casing supported by longitudinal girders. The culverts are at such a depth as will maintain at least 4 ft. of water over the top of their sea ends at the lowest recorded tide. They are level throughout almost their entire length, with the exception of a section at the sea ends, which is graded upwards on an incline of one in five for a length of 27 ft. The sea ends of each pair are situated 50 ft. from each other, with 150 ft. between each pair. At the sea end of each culvert wrought-iron grids prevent the passing of large bodies liable to damage the screening plant. Greenheart doors are also fitted at

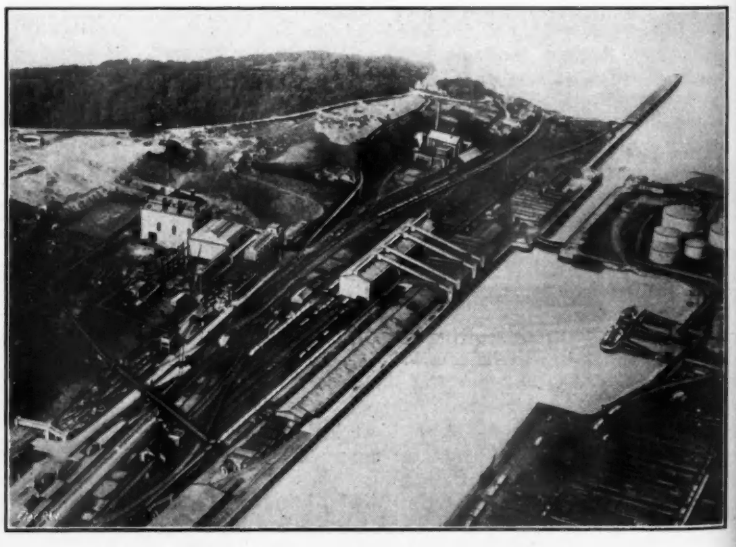


Fig. 2.—Aerial View of the Portishead Station.

* Elec. Rev., Jan. 17th, 1930, p. 141.

† See Elec. Rev., June 8th, 1928, pp. 987-8 and 991-3.

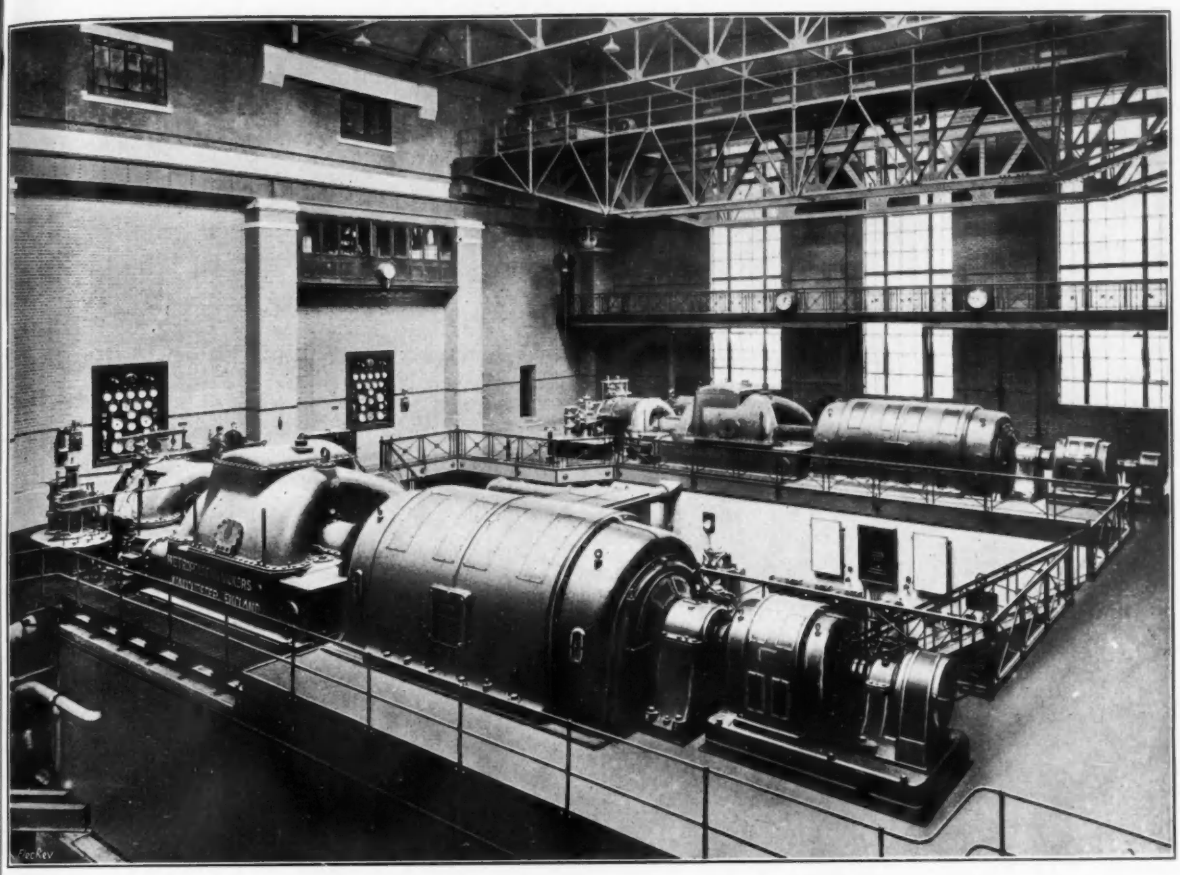
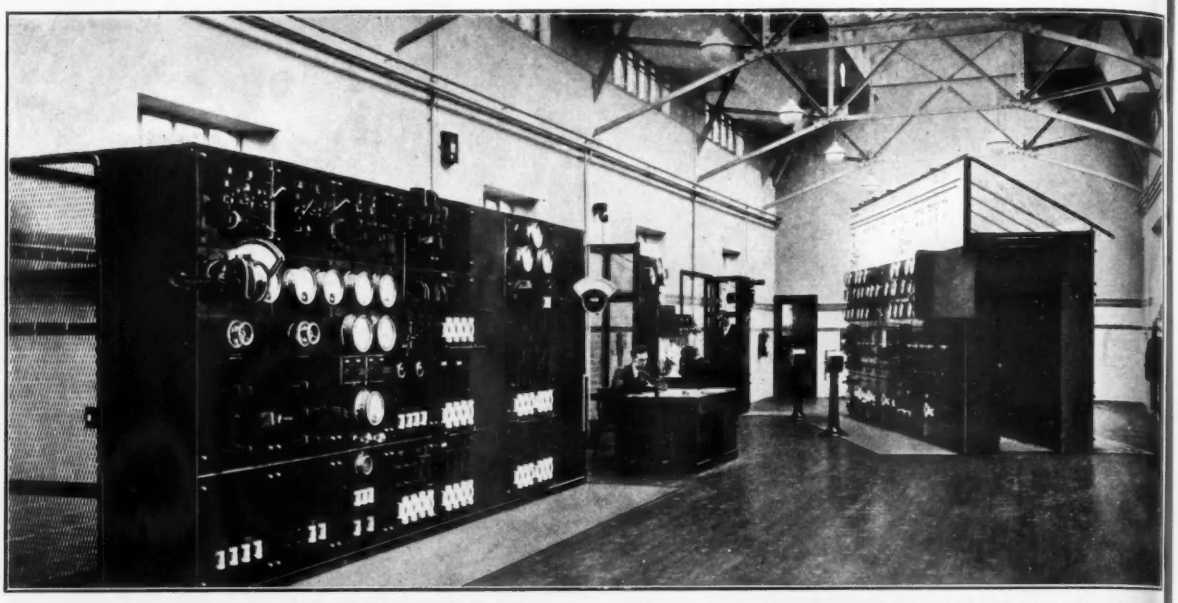
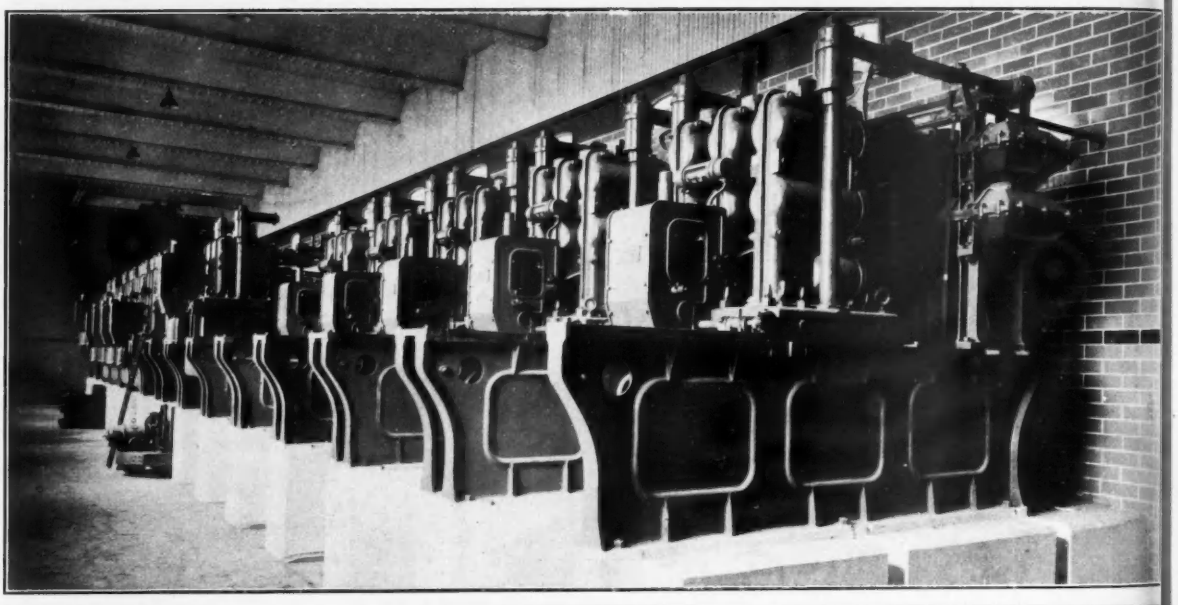


Fig. 3.—First Section of the Turbo-generator Room.

Fig. 4.—Condenser Pit-head, Lift, and Motors.





Figs. 5, 6, and 7.—Main Station Control Room and Switchgear.

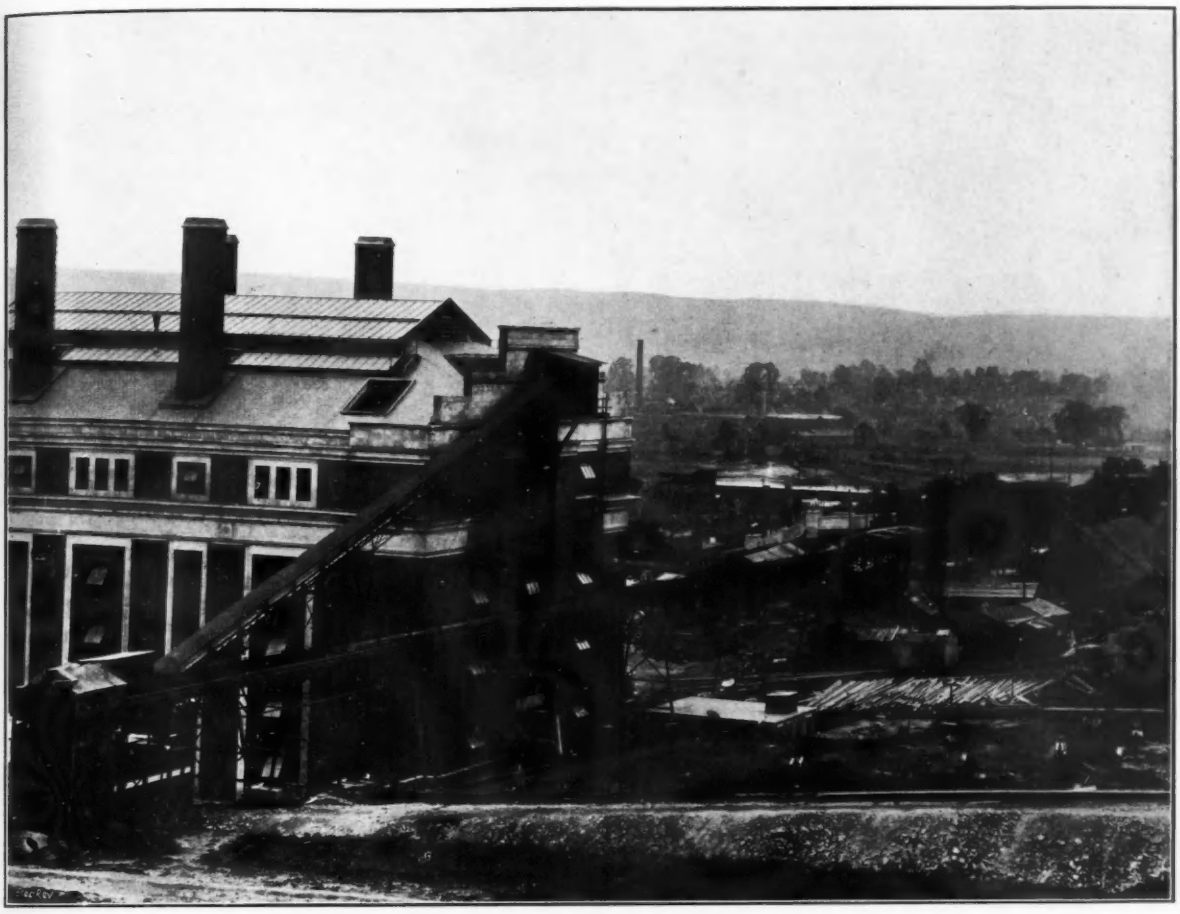


Fig. 8.—Coal Conveyor and Elevator.

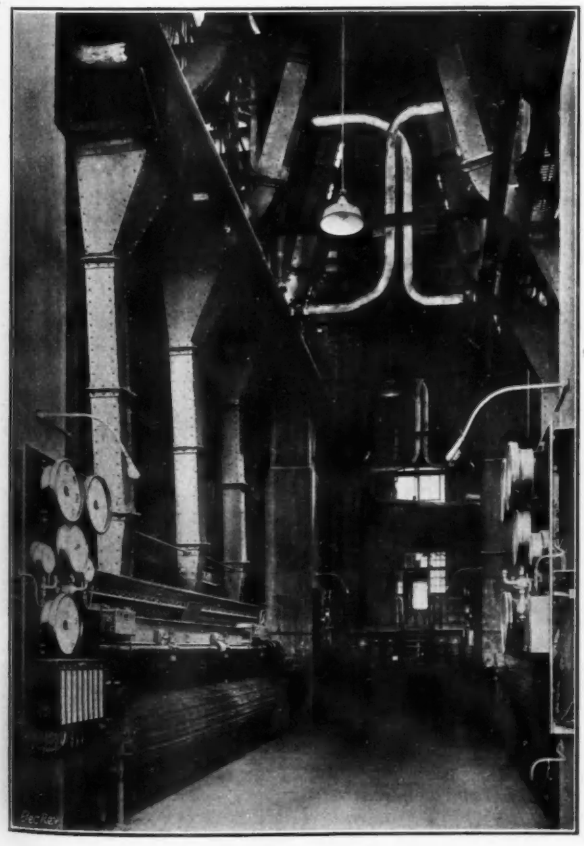


Fig. 9.—Portion of Boiler House.

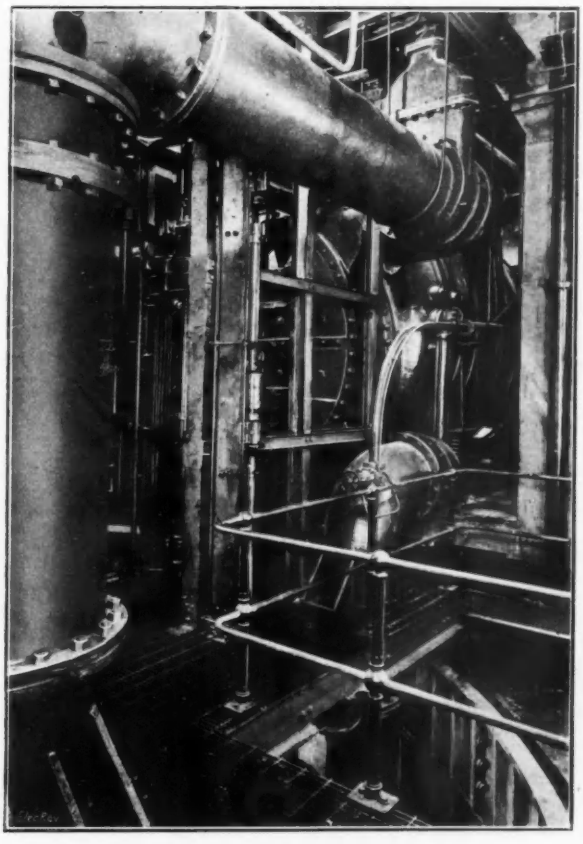


Fig. 10.—The Condensing Plant.

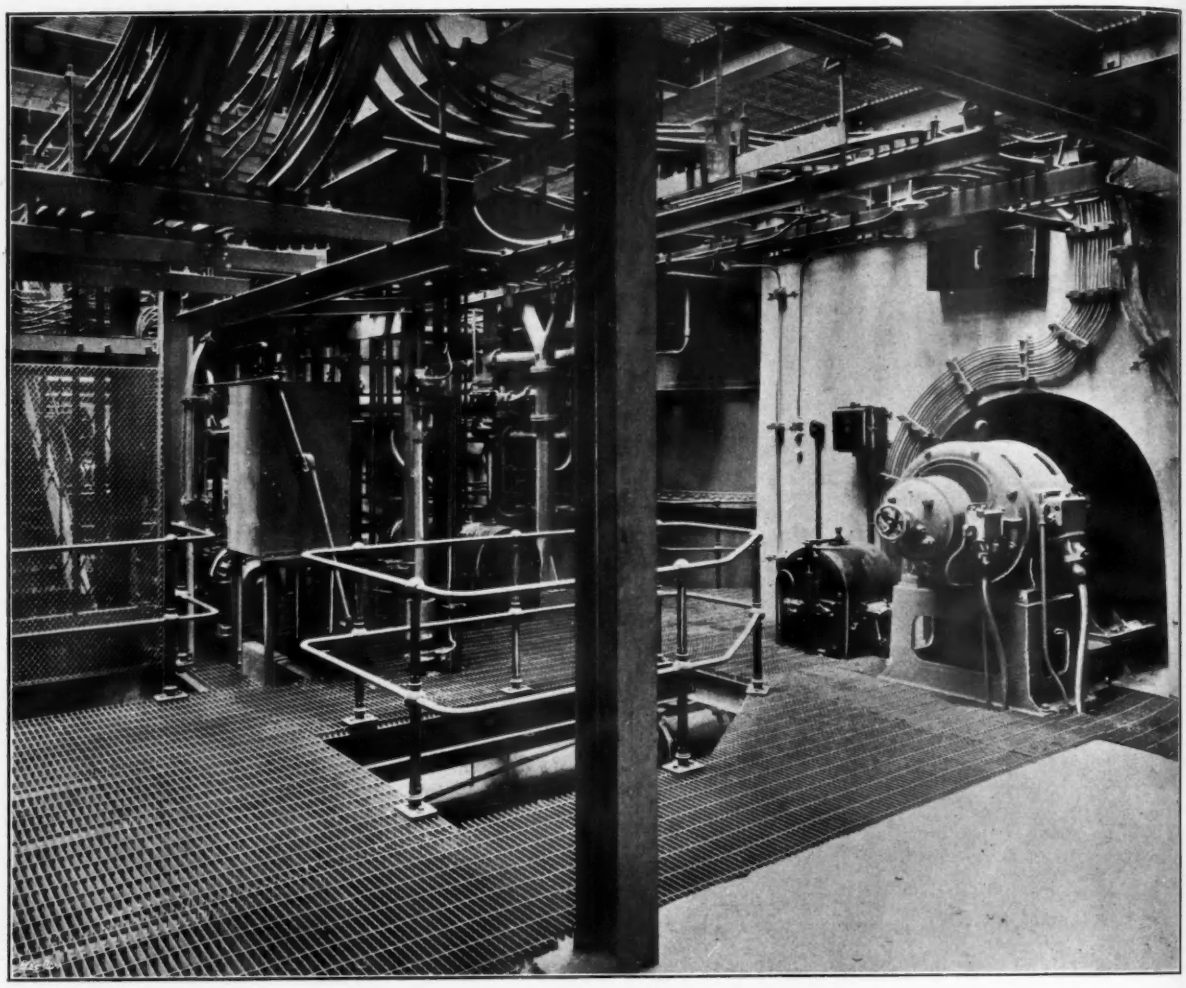


Fig. 11.—Condenser Circulating-water Pump Pit.

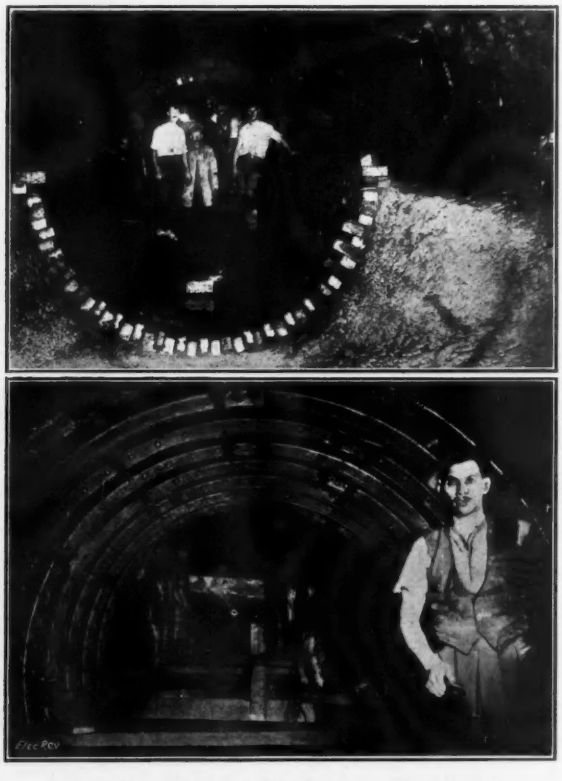


Fig. 12.—Water Culverts under Construction.

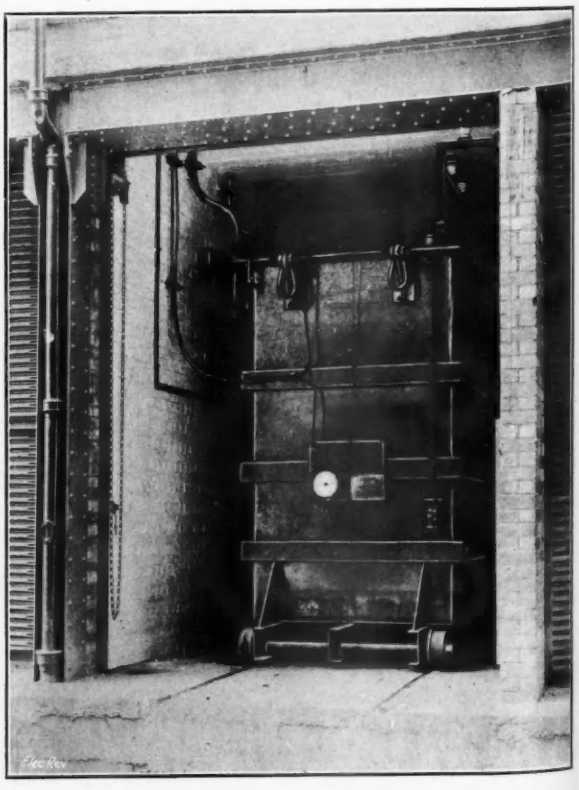


Fig. 13.—A Main Transformer Chamber.

each sea end for use when emptying the culverts for examination and cleaning. As a precaution against the accumulation of silt in their mouths a shelf has been dredged in the river bed approximately 30 ft. from the culvert inlets, whilst the system has been designed to allow of the flow of water being reversed, the culverts acting as inlet or discharge as desired. By throttling the discharge valves the temperature of the discharge water may be increased as desired with the object of destroying any marine organisms adhering to the culvert linings. The permanent screening shafts, four in number, sunk near the turbine house were utilised as working shafts from which headings were driven. Considerable quantities of water were encountered when carrying out the work under the River Severn, which necessitated the construction of iron-lined chambers with air locks, the work in that section being carried out under compressed air. The screen shafts are 17 ft. in diameter and 66 ft. deep and connect each culvert with a screen house situated on the surface. The plant is capable of dealing with the requisite quantity of circulating water at all levels of tide over a range of 52 ft. The screens are of the travelling-band type, 73 ft. 4 in. centres, arranged in pairs in each of the two pits to which culverts Nos. 3 and 4 are at present connected. Each screening shaft is equipped with an overhead hand-operated crane designed to lift each screen into the shaft and above the level of the culvert. The weight of each screen complete, as lifted by the crane, is some 15 tons.

The coal-handling installation is designed for conveying coal from barges or ships at the quay of the Portishead Dock, and also rail-borne coal to the boiler-house bunkers or to the storage dump. Two travelling quay cranes, each of 60 tons per hour capacity, situated at the wharf side, deliver the coal into a receiving hopper operating in conjunction with a series of belt conveyors crossing the Great Western Railway lines, and delivering to drag-link conveyors running over the bunkers in the boiler house. The storage dump is served by a travelling tripper on the conveyor. For reclaiming and distributing the coal an electrically-driven travelling jib crane is employed. Rail-borne coal is dealt with by two 20-ton side-discharge wagon tipplers feeding a common receiving hopper, from which the coal is drawn by means of feeder plates to two bucket elevators that discharge into the hoppers feeding one of the conveyors. An automatic coal weigher is incorporated in each tippler; automatic weighing devices are also installed at selected points throughout the system. The total length of the conveying system is 960 yards.

The ash-handling plant is composed of two lines of water sluicing troughs below the boiler-house basement floor, each designed to deal with the ashes from a battery of three boilers. The troughs converge outside and deliver into a sump, from which the ashes are taken by means of specially-designed elevators which discharge on to a belt conveyor and are then deposited by a further conveyor into a ferro-concrete bunker over the railway siding.

The electric motor control equipment of the coal-and-ash-handling plant is interlocked throughout in order to ensure that each section of the handling equipment is started and stopped in its proper sequence.

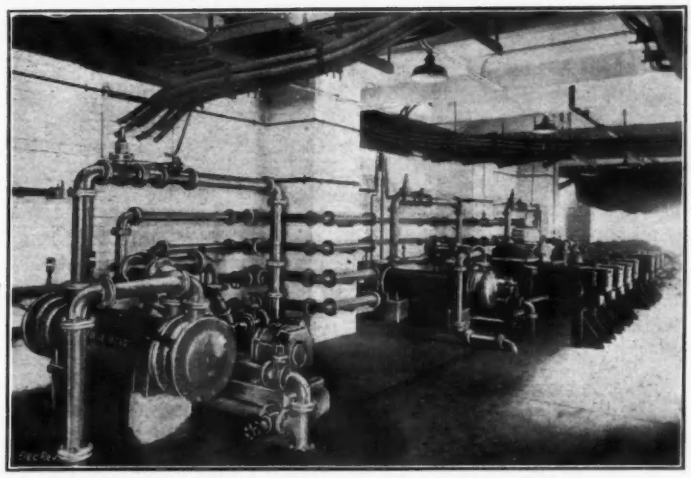


Fig. 14.—Oil Cooling and Filtering Installation.

The steam-raising plant consists of four "Vickers Header" straight-tube boilers, each having a normal evaporative capacity of 80,000 lb. per hour at a working pressure of 325 lb. per sq. in. and a temperature of 725 deg. F., but capable of evaporating 100,000 lb. per hour. Each unit consists of an intergal superheater, a large superimposed steel tube economiser of the "Header" type, Illinois chain-grate stoker, forced- and induced-draught fans (one per boiler), and a steel chimney 7 ft. 6 in. in diameter and of an effective height of 100 ft. The stokers are 24 ft. wide and are the widest now in commission in this country. Particular attention has been directed to the even distribution of fuel, for which purpose three traversing chutes are employed. The combustion air is controlled over the whole length of the grate by means of compartments, or tuyeres, 2 ft. wide extending across the width of the stoker. Air is supplied to each compartment from common "wind boxes" on each side of the stoker and regulated by adjustable dampers. The forced-draught plant is of the double-inlet "Sirocco" type and is situated in the basement. The induced-draught plant housed over each boiler incorporates a grit arrestor in the fan discharge duct to the chimney, the grit so caught being conveyed by chutes to the ash hopper in the basement. In the event of the failure of the induced-draught fans, steam jets installed in the base of each chimney will act as air ejectors.

The boiler feed-water piping is in duplicate, one turbine-driven and two motor-driven pumps situated in the turbine-house basement being employed, with inter-connecting piping so arranged as also to permit of the isolation of one boiler and pump for testing purposes. All clean water drains are collected and passed through a "cooler" to the condensers for de-aeration and return to the feed system.

A comprehensive installation of instruments includes indicators of steam flow, draught, and CO_2, grouped on boards mounted adjacent to each boiler, whilst the steam flow recorders and integrating and summation wattmeters, CO_2 recorders, and electrically-actuated distance thermometers are centralised in a control room at the turbine-room end of the firing-aisle to permit of centralised control.

The two turbines of the two-cylinder impulse type are each of 20,550 kW maximum continuous rating, and a 550-kW non-condensing turbine set has been installed for emergency house-service duty. The main turbines operate at a steam pressure of 300 lb. per sq. in. gauge, superheated to a total temperature of 700 deg. F. The high-pressure cylinder, which contains twenty expansion stages, is made of cast steel, symmetrical in design, while the diaphragms are built up of mild steel with machined nozzles. The low-pressure cylinder is of the divided-flow type: the steam, after expanding through two stages, is divided, one half being diverted to the second half of the cylinder, from which it proceeds through three expansion stages to the condenser, while the remainder of the steam is expanded through one ordinary and one multi-exhaust stage to the common exhaust. The h.p. and l.p. turbines are connected with a Bibby flexible coupling, while the l.p. turbine is coupled to the alternator semi-flexibly with a steel shell of corrugated section bolted between the ends of the respective shafts. *(To be concluded.)*

G

Electricity for the Home.

A brief account of the cost of running a house equipped electrically, with the exception of coal-fired water heating, occasional fires in the winter, and a gas wash-boiler.

By E. H. W. BANNER, M.Sc. A.M.I.E.E., A.Inst.P

AN article* on economic domestic electrification prompted the author to publish figures bearing on the problem of domestic electrification of present-day houses, as these figures show the experiment to be economically justifiable, as well to possess the much valued characteristics of cleanliness, adaptability, speed, &c.

The house contains two living rooms, kitchen, and separate scullery; upstairs are two large and two small bedrooms. The number of occupants may be stated as two, as there were one or two guests in the house for varying short periods, and there were other periods when the house was unoccupied. As it is now a little over a year since the house was occupied a full year's costs can be given.

The house was already wired for lighting by grip-conduit, and possessed what agents flourishingly call three "power-points," but, as these were 15-ampere Reyrolle sockets on the lighting mains of 3/0.036, it will be understood how much harm such a designation can cause to non-electrical people who wish to install electric fires. Ordinary fire grates are fitted, the kitchen range heating the water. In addition, a gas wash-boiler was already in the house.

After some deliberation, it was decided to add power wiring for the fires, cooker, &c., but to retain the gas wash-boiler and the coal-fired water-heating system in order to economise in first cost. The two-part tariff of the Manchester Corporation was considered to be fairly reasonable, although the high ratable value of the house involved a high fixed charge of 27s. 3d. per quarter or £5 9s. per annum. The fixed charge is based on 20 per cent. of the pre-war ratable value of the house, the running cost being 0.5d. per kWh.

The equipment included the following:—"Baby Belling" cooker, 2.75 kW total loading, which has been found eminently suitable and is thoroughly satisfactory. It is difficult to see why so many makers provide large cookers comparable with gas ovens for modern houses; there is no difficulty in catering for four persons with the "Belling," and probably more if necessary, and the saving of space in the scullery is a great advantage.

The fires include a Ferranti 1¼-kW, a G.E.C. 2-kW, and a 600-W bowl fire, of which the Ferranti is the most efficient, the radiant heat being found decidedly preferable to the slow general heating by convection obtained from the ordinary wire-wound flat-type of fire bar. All the fires are portable, so that they may be used in whatever room they may be required. The other equipment installed is: kettle, 600 W; G.E.C. vacuum cleaner, 350 W; boiling plate, 1.5 kW, which is used for milk boiling, &c., when it is not necessary to use the cooker for other purposes; warming plate, 1 kW; iron, 350 W; toaster, 350 W; a total loading of 10.75 kW or 54 A at 200 V. The lamps total 910 W, or 8.5 per cent. of the heating and cooking load, so that the lighting cost is almost negligible, but separate meters have not been installed to determine the consumption of individual items.

The additional wiring involved a new main switch and the addition of a distribution board, and a 60-A switch and an 8-way, 15 amperes per way, distribution board, were accordingly installed. The existing lighting circuits were connected to two of the ways, leaving each main heating point on a separate way. For convenience it was decided to install two outlets in each main room, so that a fire could be used continuously whilst the kettle, toaster, or warming plate could be used simultaneously. To do this two Reyrolle sockets were fixed close together, one 15 A and the other 5 A, the latter being connected to the lighting circuit in the same room, whilst the heating point had its own wiring and fuse at the distribution board.

The cooker and boiling plate incorporate their own switches, but are also controlled by a local ironclad switch; no plug and socket is used for these, as they are intended to be fixtures. No pilot lamp has been found necessary, and so none is fitted.

The fires are fitted with 15-A plugs and wired with 3-core flex, so that their frames are earthed through the earthing shield on the plug and socket. All other appliances have 5-A plugs, so that no overloading of lighting circuits by the fires can occur. For use in two bedrooms where no sockets are fitted there are two extension leads, each of several yards length, having a plug at one end and a 6-in. by 3-in. pattress with fuse, switch, and socket at the other; one is for the 15-A and the other for the 5-A circuits. The 5-A pattress also has a lampholder, so that a stand lamp can be used at the same time as the ordinary lighting pendant.

One bedroom has its 15-A socket near the fireplace and its 5-A socket near the bed head. This is for the kettle for morning tea. With the exception of the kitchen, all sockets are on the skirting board.

A coal fire is made in the kitchen for water heating usually twice a week, and during the winter coal fires were used in the living rooms during some of the week-ends. That was before the arrival of the Ferranti fire, which has led to a lower coal consumption this winter. A further point is that a considerable number of coal fires was made in the first month or so to dry-out the house thoroughly, as it was entered new. Gas is used almost exclusively for the wash boiler, so that the gas and coal bills are small in comparison with the electricity bill. In addition, both living rooms are used, there being no effort to economise heating by using the kitchen as a dining room.

The results of the year's working show a consumption of 3,500 kWh, or 1,750 kWh per head per annum; the cost of electricity was £12 14s. 10d. at 0.875 pence per kWh, which the author considers to be satisfactory, considering the very high fixed charge for the supply.

Regarding the point of cleanliness of an electrically-run house, this is apt to be a snare, as, although very little coal and gas are burned, the house is not as free from smuts as would be expected, *because neighbouring houses are not electrically equipped*, so that, for this to become apparent, it is essential that there should be no coal fires in the vicinity—a prospect of the future.

Detailed Cost for 52 Consecutive Weeks.

Electricity ...	Fixed charge	£5	9	0	
	3,499 kWh at 0.5d. ...	7	5	10	
	Total				£12 14 10
Coal	32 cwt. (price from 1/10 to 2/-)				3 0 1
Gas	18.3 therms.				14 6
					£16 9 5

From the above the following are derived:—Electricity, average 0.875d. per kWh, 3,500 kWh per annum, average 67 kWh per week, 78 per cent. of the total cost.

* Electrical Review, August 16th, 1929, p. 269.

Total cost of lighting, heating, and cooking, £16 9s. 5d. Average 6s. 3½d. per week.

Daily or weekly load curves are not given as they vary so considerably, depending on the time of the year and the weather, and also on the amount of time actually spent in the house, &c. The greatest departures from the weekly average of 67 kWh were 26 kWh minimum in July, 1929, and 169 kWh maximum in January, 1929.

An extra source of non-domestic consumption is certain electrical experimental work which is being carried on, and also a 3-kW arc used occasionally for photography. All these are metered with the main domestic load.

Since the compilation of the above year's results the Ferranti fire has been altered to one of 2½ kW, so that during the present winter only one coal fire has been used other than for water heating. Results to date show a saving in weekly cost due to the reduced coal bill. At some future time it is hoped to add electric water heating; the house will then be completely free from coal fires.

The Leipzig Spring Fair.

A Review of the Electrical Exhibits.

[By Our Special Commissioner.]

THE annual Leipzig Spring Fair was opened on March 2nd by Dr. Raimund Kohler, President of the Leipzig Fair Office. The opening ceremony was followed by a luncheon given by the Fair authorities to the Press representatives from different countries, of whom there were over 300 present. Mr. Voss, general manager of the Fair, made a speech welcoming all the visitors, and several other speeches were made by the official representatives of their respective countries. The general tenor of the speeches was to the effect that Leipzig is becoming more and more the recognised centre of international trading, and this opinion is in part supported by the fact that there has been a large increase of attendance as compared with former years.

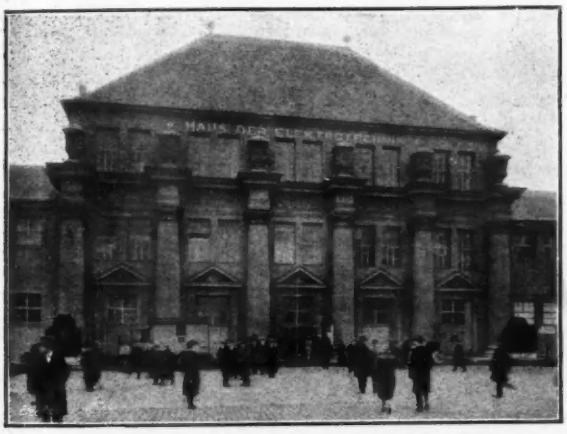


Fig. 1.—Exterior of the Electrical Building, Leipzig.

In the Fair itself the electrical industry is well represented and can be divided into three main groups, Domestic Appliances, Radio, and Industrial. These three groups are housed in different portions of the Fair ground which at first sight would appear to make the visitor's task somewhat easier. Unfortunately, however, some of the most interesting exhibits are to be found in unexpected places, and on this account are probably missed by many.

One point of interest in the general organisation is a card index system adopted by the various manufacturers. Cards are available on their stands giving details of their products and the cards bear cross index references in such a way that with a collection of cards it is possible to classify according to goods, to manufacturers' name or to the address. This system avoids the necessity of searching through endless leaflets, possibly without finding what is required. For some reason this system has been adopted by practically every section with the exception of the Electrical Section.

Domestic Appliances.

The range of domestic appliances shown is not as large as would be expected. Although the German supply companies are endeavouring to encourage the use of electrical labour-saving devices, cookers, &c., the number and quality of such appliances as exhibited do not compare favourably with the appliances exhibited at the British Industries Fair at Birmingham, for instance.

Owing to local conditions the electric floor polisher seems almost as common as the vacuum cleaner in England. Refrigerators call for no special comment and again local conditions are rather unfavourable to their use in the home. It is anticipated, however, that a law will soon be passed in Germany similar to the recent Act in England restricting the use of preservatives in foods. The general forecast is that the proposed law will deal principally with the handling of milk, and manufacturers are expecting a large demand in the near future.

A number of cookers are shown on the various stands, but very few appear to embody the refinements usually to be found in the well-known home makes. In the heating section the bowl reflector type of heater seems to be gradually disappearing in favour of the small flat element type mounted in an enamelled cast-iron frame.

Fig. 2.—Some of the Electrical Exhibitors.

Electric irons are shown on practically every stand,

the temperature regulating type with the automatic feature incorporated in the body of the iron are very strongly in favour. Incidentally, they are offered at prices but little more than the price of the ordinary electric iron in England.

Finally, the latest development in the home appliance is the miniature electric fan with 6 in. diameter blades, manufactured by the Siemens-Schuckertwerke and several others.

The Radio Section.

The radio group, which is housed partly in the Electrical Engineering Section and partly in the Automobile Section, leaves a distinct impression that any novelties which the various firms have in hand are held over until the German Radio Show which takes place in August. This year's exhibits are considerably more important than last year's, and it is understood that one of the main reasons for this is a feeling or uneasiness in the German wireless trade owing to the close proximity of the British Industries Fair.

The general movement in the industry seems also to point to a closer co-operation if not amalgamation between the radio manufacturers and the gramophone manufacturers in the not-far-distant future.

In the loud-speaker line, the majority of models shown are of the electrodynamic type, none of which seems to have any novel or outstanding features. The permanent-magnet four-pole type seems to have received most attention; the great number shown make it impossible to mention the various manufacturers of repute, but it may be interesting to note that they are listed at prices ranging from 32s. to £8.

The Telefunken Co. is showing a new range of valves designed with a view to reducing the number of standards. A number of the new valves will each replace two or more of the earlier types, although they will cover the same or a larger range of applications. The company has made a decided effort to produce valves that will satisfy the conditions of overseas sets as well as home patterns.

Amongst the accessories the attention paid to lightning arrestors is very noticeable. Two types were noted —that made by the Wickmann Werke A.G., of Dortmund, and the other by the Kathrein Blitzschutz, of Rosenheim. Both of these are of the automatic type and are left permanently in circuit. Their principle is similar to that of other well-known types of industrial arrestors, the former being similar to the horn-gap type, the latter similar to the multi-gap block type. Continuous demonstration by means of high-tension direct discharges on to the aerial are very convincing in appearance, but it remains to be seen if this method of test can be taken as a criterion for conditions which may arise in practice.

The only remaining point of interest in connection with the radio group is the amount of attention that is being paid to the portable set, both for home and tropical conditions.

German portable sets on the whole are much below the standard of the British product and at the same time are much more cumbersome. This is largely due to the difference in conditions at home and in Germany. Up to the present the demand for this type of set has been relatively small, and the manufacturers have not had the demand which results in rapid development. A serious effort is being made to popularise the portable set in Germany and several good models can be obtained at prices ranging from £10 upwards.

(To be concluded.)

Talking Film Apparatus.

A brief account of the British-made equipment installed at the Globe Theatre, Coventry, by the British Thomson-Houston Co., Ltd.

At the Globe Theatre, Coventry, talking kinematograph films are now being exhibited by means of new equipment which, it is interesting to note, is a product of the Rugby works of the British Thomson-Houston Co., Ltd. The equipment was developed in the company's engineering laboratory there, where experimental work, which has been carried out for a considerable time on sound-reproducing apparatus, has resulted in an all-British product, both as regards design and manufacture.

The company's standard reproducer operates with the well-known R.-K. loud-speakers. The initial signal for reproduction from the sound recorded on the film is obtained from a photo-electric cell manufactured in the "Mazda" lamp works at Rugby. An underlying idea in the design of the equipment is simplicity both of operation and maintenance: to this end battery supplies have been eliminated and switches, controls, &c., reduced to the minimum. The primary source of electrical energy is a motor-generator set for feeding the loud-speaker fields, projector motors, a small rotary convertor for energising the main transformers of the amplifier, and a small transformer for operating the signalling device between the auditorium and projector box.

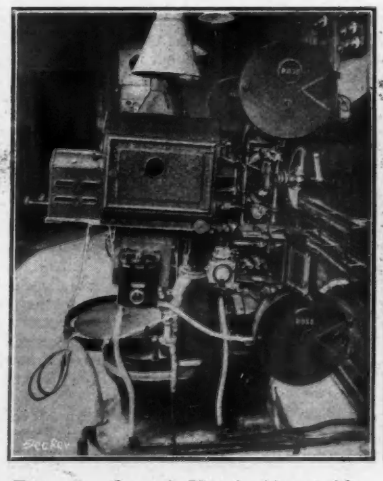


Fig. 1.—Sound Head, Turntable, and Ross Mute Head.

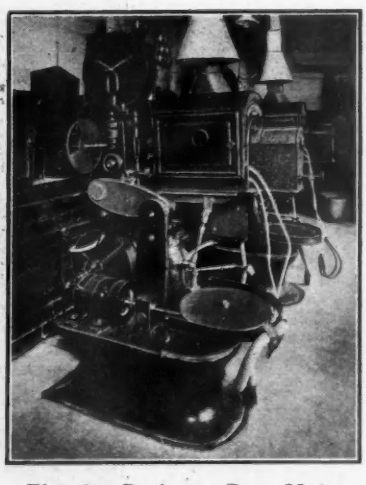


Fig. 2.—Projector Box, Motor, and Synchronous Turntable.

The projector motor is controlled in such a way that very close speed regulation is assured. A drum-pattern controller with one running position and one braking position is provided, and a signal lamp is fixed opposite a red lens to warn the operator when the controller is in the braking position.

The projector sound heads are arranged so that they may be assembled with a number of the different mute heads commonly in use at the present time. Fig. 1 shows the sound head assembled with a cast-iron stand carrying the turntable and Ross mute head.

At the back of the sound head is a chamber containing the exciting lamps mounted in a prefocusing holder that accommodates three lamps, so that in the event of one lamp failing, another can be instantly brought into service. The chamber also contains a filament rheostat and ammeter for controlling the exciting-lamp current.

A front chamber of the sound head contains the photo-electric cell and its transformer, which steps down the signal

from the cell to a low-impedance circuit connected to the amplifier input transformer, *via* the control box.

Between the front and rear chambers of the sound heads are mounted the film sprockets, sound gate, and optical system, all of which are easily accessible. The control box is mounted on the front wall of the projector box adjacent to one of the projectors. It contains a change-over device to bring either projector into operation; the change-over device can be operated from two points, each control point being located in a convenient position adjacent to a projector. The box also contains a switch for changing from gramophone disk to film reproduction, and a telephone jack to take an output plug from a non-synchronous gramophone. This arrangement provides complete control of the sound output without its being necessary for the projectionist to leave his machine.

The whole of the amplifier components are contained in one rectangular metal cabinet, shown in figs. 3 and 4, on

Figs. 3 and 4.—Amplifier Cabinet: closed and open.

the front panel of which are mounted the instruments for checking the operation of all the valves in the amplifier. The various sections of the amplifier are assembled on metal trays, which slide into the cabinet, and may be easily withdrawn for inspection, test, or replacement.

The front door of the amplifier cabinet is fitted with a fool-proof interlock, so that it is impossible for the h.p. circuits to be "alive" when the door is not properly closed. A monitor loud-speaker is provided in the projection room, as shown on top of the cabinet in figs. 3 and 4.

Glare Measurement.

The subject of glare is one of vital importance in many of the problems of illuminating engineering. Many attempts have been made to obtain quantitative measurements of glare, but the subject is one of extreme difficulty, and it is only by taking a very large number of observations under different conditions that it is possible to obtain a reliable quantitative measure of the effect. It seemed to the Illumination Research Committee of the Department of Scientific and Industrial Research that the subject was one in which it was desirable to institute a thorough research, starting from the first principles, and Illumination Research Technical Paper No. 8 of the Department (H.M. Stationery Office, 2s. 6d. net) describes the methods and results obtained during the past three years at the National Physical Laboratory. The work has been conducted by Mr. W. S. Stiles, and the greater part of the observations have been made by him and by his two assistants, Mr. G. C. Cornford and Mr. B. J. W. Oram, who have taken part in the work from the beginning.

The B.E.S.A. Dinner.

An account of the function in celebration of the granting of the Royal Charter.

THE commemoration dinner of the British Engineering Standards Association was held at the Grocers' Hall, E.C.2, on March 6th.

Mr. Maurice F. G. Wilson, chairman of the Association, presided over a gathering of some 300 persons, and proposed the loyal toasts.

The Duke of York, proposing the toast of "The British Engineering Standards Association," said: "I am glad to have the opportunity of identifying myself this evening with the work which this Association is doing, for any public movement which assists in maintaining British quality, combined with economy in production, must demand the attention of all thoughtful people, and deserves the support of every branch of industry. Particularly is this the case at the present time, when the country's attention is being turned towards the imperative necessity of improving our trade position as the vital factor in bringing about more employment. Fortunately, the spirit of co-operation is to be found everywhere in industry to-day, and this is doing much to help a general reorganisation along the most modern, scientific, and economic lines, without which no enterprise can flourish.

This Association has laboured unceasingly to create and foster this spirit of co-operation, and has achieved marked success in persuading the various branches of the great engineering and allied industries of the country to come together and unify and simplify their needs. The result of this co-operation, developed, as it has been, on a sound national basis, has been quite remarkable. For this association, while possessing no legislative authority, nor yet being subject to any Government control, has gained, to a notable degree, the confidence of industry, so that manufacturers find themselves constrained to make use of the British standard specifications, and the purchasers, although free to order what they like, in the great majority of cases accept your recommendations.

I am told that you employ the greatest safeguards to prevent your work from interfering in any way with design, and that these British standards, which are known and valued all over the world, have as their real object the establishment of a basis for the comparison of tenders, rather than the standardising of a pattern. Thus the producers are able to exercise their imagination and genius in the design and manufacture of their products. The adoption of these specifications by the spending Departments of the Government and by all the local authorities must go far to increase the confidence of manufacturers during slack times. I understand that in our export trade British standard specifications are becoming of enhanced value, and I am glad to think that, with the enlarged financial support recently granted by the Treasury, you will again be in a position to translate these specifications into foreign languages and so place what British manufacturers have to offer before prospective purchasers in their own language.

Last, but not least, through your intimate connection with bodies similar to your own in the self-governing Dominions overseas, you are achieving a measure of Imperial agreement in the preparation of these national specifications. In the further development of this work you will certainly have the unstinted support of the public, as such agreements are bound to benefit both manufacturers and purchasers, who are often separated by great distances in our widely flung Empire.

With such an impartial organisation in our midst to co-ordinate this work we need have no fear of over-standardisation or the loss of individual enterprise. We may rather look forward to your Association increasing its usefulness to industry. And so, gentlemen, I congratulate you most warmly on having obtained a Royal Charter, and I hope that you will continue to prosper in carrying on your great national work. I give you the toast of the British Engineering Standards Association."

The chairman, responding, said that the interest shown by His Royal Highness would be of the greatest value, assistance, and encouragement to them all in their work. His Royal Highness had very appropriately dwelt on the spirit of co-operation which animated the work of the Association, and the impartial manner in which it was carried out. The results of its work were arrived at by general consent. Any member of the Association had an opportunity of being elected to the Council, while the community interest of producer and purchaser was maintained throughout.

Since the war standardisation had advanced rapidly, modelled in many cases on British methods, but some had expressed concern as to where it was leading, and feared it might hinder initiative in design. Variety was dear to human nature, and the fear of losing it was very real, but the utmost safeguards had been provided. Only a small proportion of the work of the Association dealt solely with the question of the pattern, the majority of the work dealing with questions of quality and performance. The aim of the Association was to produce, by the consent of all concerned, British Standard Specifications

based on good average present-day practice, without, however, aiming at an ideal which might be too costly for adoption. Its more immediate result was to bring about economy in manufacture, saving in preventable waste, and reduction to a reasonable proportion of the too great variety of types still prevalent.

The Government grant was £3,000 a year for five years and was to be increased to a maximum of £5,000 a year depending on the Association obtaining increased support from industry. Its only expenses were office staff and accommodation. It had organised 500 committees.

The chairman referred to the presence of Mr. H. J. Skelton, who in 1895 wrote to *The Times* with regard to the enormous variety of steel sections which then existed, and the great desirability of standardisation. Engineers of this country had had the foresight to see that this work could only go forward successfully if it were on a fully co-operative basis of a national character, with the support of the Government.

Mr. Ll. B. ATKINSON, chairman of the finance committee, in a racy speech proposed the toast of the "Guests," with particular reference to Lord Thomson, the Minister for Air, to Mr. H. J. Skelton, "the father of British standardisation," and to Mr. C. Le Maistre, director of the Association.

Lord THOMSON, Secretary of State for Air, replied, in the absence of the President of the Board of Trade. He paid a tribute to the valuable work of the Association, work that had saved much expenditure to his own and other spending departments. He congratulated the Association on its success in the difficult feat of obtaining more money from the Treasury.

Mr. H. J. SKELTON said it was true that about 1895 he had urged that something should be done to release some of the capital locked up in large stocks which might be more remuneratively employed elsewhere. What had roused him to action was the impossibility of obtaining in this country, in the requisite time, a bridge to enable Lord Kitchener to cross the Atbara. In 1900 he read a paper before the British Iron Trade Association advocating standardisation. He hardly, however, recognised the organisation as it stood to-day, so great had been its progress. He was confident that this country would emerge from the present trying times, as we had the will to succeed. British goods were unsurpassed for quality (and that quality must on no account be lowered), but our salesmanship left something to be desired.

Lord RUSSELL (Under-Secretary of State for India) proposed a vote of thanks to the chairman, who briefly responded.

During the dinner a programme of music was rendered by the "Nulli Secundus" orchestra under the direction of Mr. N. Richardson, and afterwards a reunion took place in the spacious and dignified rooms of the building.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

Italian Foreign Electrical Trade.

The appended table shows the Italian imports and exports of electrical machinery and apparatus during last year, as compared with 1928. The values have been converted to sterling at an exchange rate of 93 lire to the £. It will be seen that both imports and exports show an increase—the former of £697,035 and the latter of £195,445.

	Imports.		Exports.	
	1928. £	1929. £	1928. £	1929. £
Accumulators and parts	31,955	84,035	37,900	20,135
Incandescent lamp bulbs	33,065	59,505	25	30
Electrical measuring instruments ...	45,090	62,195	1,385	2,840
Electrical apparatus, miscellaneous ...	777,370	770,150	108,170	147,875
Telegraph, telephone, and radio apparatus	895,115	1,543,140	28,535	33,330
Electric furnace and other carbons ...	158,950	170,558	5,730	4,720
Insulated cables ...	31,100	27,900	187,430	183,955
Generators "without collectors"	225,890	229,435	13,580	25,675
Generators "with collectors"	240,145	282,660	230,435	349,725
Glass and porcelain insulators	34,865	25,590	16,160	21,290
Arc lamps	610	615	—	200
Incandescent lamps ...	427,935	350,965	79,175	91,755
Static transformers ...	58,620	82,440	9,000	20,885
Insulating tubes ...	395	465	3,260	1,950
Electricity meters ...	109,435	92,965	3,150	4,055
Insulated wire ...	33,420	18,380	53,590	64,550
Totals	£3,103,960	£3,800,995	£777,525	£972,970

Great Britain's Radio Exports.

The *Wireless and Gramophone Trader* publishes details of the exports of radio apparatus from this country during 1929. The total value is given as £1,177,107, as compared with £1,109,555 in 1928 (excluding re-exports, which rose from £25,398 to £57,532). The most important importer of these goods was Holland, whose share was valued at £146,178 (against £89,731). Australia, which led with £150,847 in 1928, reverted to second place with a share of £138,850. Japan's portion of the trade increased from £51,779 to £78,248, and that of the Irish Free State from £51,530 to £63,545. Other important customers were Italy, £52,878 (against £36,891); Belgium, £49,976 (against £34,454); South Africa, £49,511 (against £56,379); India and Burma, £48,310 (against £53,891); Spain, £47,011 (against £24,775); and France, £45,093 (against £75,234).

New Italian Companies.

Among the companies recently formed in Italy are the Società Elettrica Alto Sangro, Rome, capital 1,500,000 lire; La Società Luce Elettrica Salerni, Salerni (Trapani province), 1,000,000 lire; La Società Elettro-Irrigua Siciliana, Milan, 1,500,000 lire; La Società Italiana Porcellane Elettrotechniche, 100,000 lire; La Società Idroelettrica del Golfo di Squillace, Milan, 200,000 lire; and La Società Communicazione Elettriche Albanese, Rome, 100,000 lire, to establish and work telegraphic, telephonic, and wireless services in Albania.

German Radio Exhibition.

The seventh annual German radio exhibition is to be held in Berlin from August 22nd to 31st next. A section for gramophones and records is to be included in this year's show.

New Rumanian Company.

A new company has been formed in Bucharest, with the title of La Société des Usines Electriques de Cluj, to acquire and extend two electric power stations in the town of Cluj. The Société Electrobel, of Brussels, and the Société des Charbonnages de Transylvanie are interested in the new undertaking.

The Egyptian Market for Batteries.

A confidential report on the market for accumulators and batteries in Egypt has been prepared by the Department of Overseas Trade from information furnished by the Commercial Secretary to the Residency, Egypt, and issued to firms whose names are entered on its Special Register. United Kingdom firms desirous of receiving a copy of this report, together with particulars of the Special Register service of information and form of application for registration, should communicate with the Department, 35, Old Queen Street, S.W.1.

Under the new Customs tariff there is a 12½ per cent. *ad valorem* duty on electric accumulators and parts imported into Egypt.

Exhibits at the B.I.F.

In our last issue we mentioned the names of firms which showed domestic lighting fittings at the British Industries Fair, Birmingham. By an oversight we omitted to include Messrs. WM. MCGEOCH & Co., LTD., whose display of lighting fittings, &c., included a number of examples suitable for home lighting.

OZONAIR, LTD., informs us that the electric fan-operated air ozoniser which we mentioned in our last issue as being included in the display of the Dowsing Radiant Heat Co. at Olympia, was an "Ozonair" product.

The Balance of Trade.

The *Board of Trade Journal* for March 6th contains a survey of Great Britain's trade position during 1929. It is shown that while "visible" imports exceeded exports by £366 millions (against £358 millions in 1928), the estimated net receipts from overseas investments, shipping services, &c., were £517 millions (against £510 millions). Thus the balance in our favour amounted to £151 millions, practically the same as in 1928, but £37 millions more than in 1927.

Cables for the Central Board.

The accompanying illustration depicts some work recently carried out by British Insulated Cables, Ltd., for the Central Electricity Board. The cables are .25 sq. in., 3-core, 33,000-V,

A Straight Run of B.I. Cables erected on Concrete Supports.

and link up the Willesden power stations of the London Power Co. and the North Metropolitan Electric Power Supply Co.

The Market for Batteries in Uruguay.

A confidential report on the market for secondary and primary batteries in Uruguay has been prepared by the Department of Overseas Trade from information furnished by the British Vice-Consul at Montevideo and issued to firms whose names are entered on its Special Register. United Kingdom firms desirous of receiving a copy of this report should communicate with the Department at 35, Old Queen Street, S.W.1.

Czecho-Slovakian Electrical Imports.

During January the imports of electrical machinery and apparatus into Czecho-Slovakia had a value of 42,000,000 cr. (£256,000), as compared with 26,000,000 cr. (£158,500) in January, 1928.

Olympia Floodlighted.

The façade of the new extension of Olympia, W.1, is illuminated at night by means of G.E.C. floodlighting equipment. The work, which was carried out by Messrs. Francis Polden and Co., Ltd., involved the installation of over thirty rectangular projectors of special construction. These are about two feet square, mirror lined throughout and of waterproof construction; each houses a 1,000-W standard "Osram" gas-filled lamp. The height of the building is 55 ft. The lanterns are spaced at 10-ft. intervals with a 7½-ft. projection from the facia.

Approval of Electrical Material in Belgium.

At the instance of the Union des Exploitations Electriques en Belgique, the principal electricity supply undertakings have agreed only to permit the use in electrical installations of wires, cable, and insulating tubes bearing the quality mark ("C.E.B.") of the Comité Electrotechnique Belge. In the near future it is intended also to require that all switches and other small apparatus in connection with electrical installations shall bear the "C.E.B." quality mark, particulars of which can be obtained from the Comité, 154, Rue Royale, Brussels.

Trade Union Allegations Withdrawn.

Complaints against the Revo Electric Co., Ltd., whose tender for the supply of electric cookers had been recommended for acceptance, have been investigated by the Labour Officer of the Manchester Corporation. As they could not be substantiated, the Electricity Committee reaffirmed its previous decision to place the order with the company. According to the report of Mr. E. Bishop, the Labour Officer, submitted to the City Council on March 5th, it was complained by Mr. H. Sinclair, National Organiser of the Ironfounding Workers' Association, "that the Revo Co. is not a 'fair' firm within the meaning of the Council's Standing Order No. 77." A conference was arranged and attended by the managing director, the commercial director and the foundry manager (representing the Revo Co.), Mr. Sinclair and Mr. Bishop. At the close of the discussion Mr. Sinclair stated that he was satisfied that his complaint was not substantiated. He thereupon withdrew his complaint, including the allegation that the company prevented its employés from joining trade unions.

The F.B.I. and Depreciation.

A deputation from the Federation of British Industries met Mr. Snowden, Chancellor of the Exchequer, last week to place before him the Federation's views on Budget matters. One subject was the question of depreciation allowances for the purpose of income tax. It was pointed out that the present rates were inadequate, even in ordinary cases, but now that rationalisation, involving the scrapping of plant before the end of its useful life, was proceeding, the inadequacy was emphasised. The F.B.I. considered that the existing law should be amended to remove the condition that replacement was necessary before allowance could be made for income-tax purposes.

Association of ex-Siemens Men.

With reference to the paragraph relating to the above Association in our last issue (p. 443), Mr. J. Snow Huddleston's address at Dagenham Dock, Essex, should not have been associated with Messrs. Siemens Bros. & Co., Ltd., whose works are at Woolwich. The Association is for ex-members of the company only.

Recent Contracts.

British Insulated Cables, Ltd., has secured the contract for erecting an overhead line from Stourport to Banbury to the order of the Shropshire, Worcestershire and Staffordshire Electric Power Co. This line, 50 miles in length, is to consist of steel-cored aluminium conductors supported on steel lattice towers. The voltage is 66,000, and the value of the work is in the neighbourhood of £110,000. The steel-cored aluminium conductors will be manufactured at the Prescot works of the company.

The Hull Corporation Tramways Department has placed an order for 5,000 telephone insulators with the Equipment and Engineering Co., Ltd.

The Bath Corporation Electricity Department has placed an order with the Brush Electrical Engineering Co., Ltd., for a 7,000-kW Brush-Ljungström turbo-alternator. This is the fifth set of Brush-Ljungström manufacture to be installed by this Corporation since 1921.

The D.P. Battery Co., Ltd., has recently supplied two "Kathanode" batteries of 50 cells, each having a capacity of 224 Ah at the 5-hour rate, for the starting and lighting of two 50-ton Diesel-electric locomotives which the General Electric Co., Ltd., has constructed for the North-Western Railway Company of India.

The D.P. Battery Co. has also received from the Racecourse Betting Control Board an order for a further eight "Kathanode" batteries for operating totalisators. This order follows upon a previous order for six batteries which have been in operation, travelling from one racecourse to another, since July last. Each of the new batteries ordered will consist of 54 cells having a capacity of 500 Ah at the 5-hour rate of discharge.

The accompanying illustration shows six lorries, five of them new Crossleys, used for carrying portable power stations. Four of the lorries each contain a "Kathanode" battery with a capacity of 500 Ah, giving a total battery capacity of 2,000 Ah

A Mobile Power Station with "Kathanode" Batteries.

used for operating these machines. The other two lorries contain the generating sets. It is anticipated that about double the capacity will be required for the totalisator at Newmarket.

Messrs. E. J. Walsh & Co., Edinburgh, have recently received the following orders:—Edinburgh Corporation Tramways, cable; Falkirk Corporation Electricity Department, meter boards; Sunderland Corporation Tramways, 150 tramway poles; Dundee Corporation Tramways, fishplates; Hastings Tramways Co., Ltd., feeder pillars; Belfast City Tramways, fishplates; Carlisle Transport Co., Ltd., tramway poles; Dunfermline Traction Co., Ltd., feeder pillar; Wemyss & District Tramways Co., traction motors, &c.; Dundee & Broughty Ferry Trams, gear wheels; Aberdeen Tramways, overhead material (Messrs. Birkbys).

Social Events.

The magnitude of the business of W. T. Henley's Telegraph Works Co., Ltd., and Henley's Tyre & Rubber Co., Ltd., was well demonstrated on Saturday evening last when representatives of the companies' staffs, numbering about 550, gathered at the Great Central Hotel, Marylebone, for their annual dinner. The ladies attended in full force, which made it possible for a successful dance to follow the dinner. Mr. H. Savage, manager of the North Woolwich works, presided, and the guests included Sir George and Lady Sutton and other directors of the company and their ladies. To the great credit of the organisers, there was only one toast (apart, of course, from the King's health). This was "The Companies and the Chairman," and it was ably proposed by Mr. A. H. M. Jacob, secretary of Henley's. Mr. Jacob reminded the gathering that Henley's was registered as a company exactly 50 years ago; that period had been one of the greatest prosperity, and he saw no reason why the next half-century should not be one of equal or greater progress. At the present rate the business of the Tyre Company would soon rival that of its parent. He regretted to announce that Mr. Savage, who in forty years had risen from a very junior position to become manager of the North Woolwich works, had decided to retire in June. In responding to the toast, Mr. Savage said that the electrical industry was destined to continue its great advance. He drew attention to the modern tendency for similar concerns to draw together. That might happen to their own industry, but he hoped that even if the company's identity was one day merged in a larger union, the spirit which had given the company prosperity would remain. He suggested that next year a representative of the Tyre Company should preside at the dinner. He concluded by thanking the staff for their support during his service with the company.

As the dinner concluded at about 8.30, ample time was available for the dance in the Winter Garden of the hotel, which proved most enjoyable.

Mr. E. F. Bulmer, chairman of the Electricity Committee of the Hereford City Council, on February 27th, entertained the electricity staff to dinner, in connection with the transfer of the undertaking to the Shropshire, Worcestershire, and Staffordshire Electric Power Co. The guests numbered about 60, and included the Mayor, Mr. G. D. Coe, and representatives of the Power Co., including Mr. J. T. H. Legge, managing director, Mr. L. Howles, chief of the staff, Mr. T. E. Boothby, power station engineer, and Mr. R. C. Roberts, mains engineer. During the proceedings the employés of the undertaking presented to the Corporation for inclusion in the Municipal plate a silver combined cigar and cigarette box.

The annual carnival of the Igranic Electric Co., Ltd., was held on February 28th at the Corn Exchange, Bedford, the party consisting of about 450 employés and guests, including a large contingent from the London office. Music was provided by an excellent band, under the direction of Mr. Jack Finch, and the "Igranophone" electrical reproducing equipment. For making announcements during the evening, the "Igranophone" transverse current microphone was used in conjunction with the reproducing equipment. The costumes were varied and ingenious, and the judging, which was carried out by ballot, proved a difficult matter. Thanks to the generosity of the directors and the senior officials of the company, a large number of valuable prizes were awarded for the best costumes. Mrs. A. H. Curtis, wife of the general manager, presented the prizes, and brief speeches were made by Mr. Curtis and Mr. A. H. Mackley, the chief engineer.

The newly-formed G.E.C. Rowing Club has distinguished itself in winning a number of river events recently. On February 15th, it competed successfully with St. Bride's Rowing Club on the Thames, while on March 1st two fours proved equally successful. The duties of starter were ably carried out by Mr. R. H. Bailey.

New Catalogues and Lists.

Calendar-blotters for March have been received from Messrs. De Brunner & Lang-Sims, 3 and 4, King Street, W.C.2; Messrs. S. Rogers & Co., Ltd., 15, Fitzroy Street, Tottenham Court Road, W.1; Messrs. Mavor & Coulson, Ltd., 47, Broad Street, Glasgow, S.E.; and Pope's Electric Lamp Co., Ltd., 5, Arthur Street, New Oxford Street, W.C.2.

Venner Time Switches, Ltd., 45, Horseferry Road, S.W.1.—List No. 42b (replacing 42a) containing particulars of the company's time switches for street lighting, enlivened by views of places in which they have been installed, as well as pictures of the switches themselves. Priced.

Hamworthy Engineering Co., Ltd., Poole, Dorset.—List No. 824 drawing attention to the company's petrol-engine driven starting-compressor sets.

Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.—A booklet entitled "Electric Light in Your Country House," reviewing in an entertaining and informative manner the problem of satisfactorily lighting country residences, with particular reference to Chloride storage batteries.

Messrs. W. J. Furse & Co., Ltd., Traffic Street, Nottingham.—Lists Nos. W. 26 and 27, containing, respectively, illustrated particulars of slider type and radial type dimmers for kinemas, theatres and music halls.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, E.C.4.—A comprehensive catalogue (pp. 56), illustrated and priced, dealing with the company's l.p. fuse and switchgear incorporating "Zed" fuses.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—Two illustrated leaflets drawing attention to the company's standard three-phase protected-type squirrel-cage motors.

Messrs. A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Pamphlet No. 730, describing the company's metal-clad oil-immersed ring-main isolators with provision for teeing-off a small supply. Illustrated.

Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Liverpool.—An illustrated price list dealing with cables and accessories suitable for overhead distribution and service systems. Also a blotter illustrating the laying of a "Liverpool" l.p. cable by the Halifax Corporation

Relay Automatic Telephone Co., Ltd., Marconi House, Strand, W.C.2.—An illustrated leaflet drawing attention to Relay automatic telephones.

Keighley Gear Cutting Co., Aireworth Works, Keighley.—An illustrated descriptive leaflet dealing with "Keighley" worm reducing gears.

Messrs. Siemens Bros. & Co., Ltd., Woolwich, S.E.18.—Catalogue No. 160 (Section 1) giving particulars of the company's l.p. feeder pillars.

Typerlite Co., 86, Cannon Street, E.C.4.—A pamphlet illustrating "Typerlite" fittings for workshop benches, bank counters, desks, &c.

Bankruptcy Proceedings.

J. Cave and T. W. Bowler (Taylor & Wynne), electrical engineers, Back 180, Green Lane, Small Heath, Birmingham.—Trustee, Mr. C. Hoult, Official Receiver, 191, Corporation Street, Birmingham, released February 17th.

C. J. Meredith, electrician, late of Princess Road, Torquay.—Trustee, Mr. W. R. Cocks, Official Receiver, Exeter Bank Chambers, Broadgate, Exeter, released February 19th.

W. T. Jacob, wireless engineer, 14, Mevrick Street, Pembroke.—Trustee, Mr. H. W. Thomas, Official Receiver, 4, Queen Street, Carmarthen, released February 19th.

M. K. Clements (K. Raymond), wireless apparatus dealer, 27 and 28a, Lisle Street, Leicester Square, W.C.—Receiving order made February 27th on a creditor's petition. First meeting held March 13th. Public examination April 2nd, both at Carey Street, W.C.

L. J. Coller (J. & F. Coller), electrical engineer, 63, Henton Road, Leicester.—First meeting March 11th at the Official Receiver's office, 1, Berridge Street, Leicester. Public examination April 4th, The Castle, Leicester.

G. Cohen, electrical engineer, 49, Newman Street, Oxford Street, W.C.—Date fixed for rehearing of application for discharge, March 26th, at Carey Street, W.C.

Company Liquidations.

Burgoyne Wireless, Ltd., York Road, King's Cross, N.—A meeting of the creditors was held on March 3rd at the offices of Messrs. Baker, Sutton & Co., Eldon Street House, E.C., when a statement of affairs was presented which disclosed liabilities of £4,121 and net assets of £1,636, leaving a deficiency of £2,485. The issued share capital of the company was £4,004, so that there was a deficiency as regarded contributories of £6,489. Mr. Milner Gray stated that the company was formed on December 14th, 1928, with a nominal capital of £6,000, and it took over the business of the Burgoyne Manufacturing Co., Ltd. Messrs. Fordhams, Ltd., had a debenture and appointed a receiver in October, 1928; they held 4,000 shares in Burgoyne Wireless, Ltd. Mr. Baker said that there had been a trading loss of £5,418 since the company's incorporation. The company had every hope of making a substantial profit during the autumn trade. The solicitor for the company said that Messrs. Fordhams could not make an offer because a receiver had been appointed of that company and it had also gone into liquidation. He had been approached by a firm to know whether the company would sell its assets and goodwill. The receiver for the debenture holder had sent out a price which would give the creditors a fairly good dividend if the negotiations materialised. He suggested that a committee of inspection should be formed to investigate the whole of the affairs of the company, and if necessary to report to a further meeting. This was agreed to and Mr. Baker was appointed liquidator with a committee of inspection.

H. A. M'Queen & Co., Ltd., electrical engineers, 182, West George Street, Glasgow.—At a meeting of creditors on February 28th in Glasgow, a statement of affairs was submitted showing ranking liabilities of £3,773 and assets estimated to realise £5,868, leaving an apparent surplus of £2,095. The company commenced trading in October, 1928, being an amalgamation of two existing businesses. It was intended that the company should carry on a trading business, and also start the manufacture of switchboards. It was estimated that the profits from the trading would be sufficient to enable the company to carry on until the manufacturing side paid its way. The vendors were allotted fully paid shares in payment for the assets transferred. The company then found itself short of working capital, as the turnover on the trading side of the business did not come up to expectations. A resolution was passed confirming the appointment of Mr. Hutcheson, as liquidator of the company, together with a committee consisting of the representatives of the General Electric Co., Ltd., the British Electric Co., Walter & W. B. Galbraith, and Mr. McMillan.

North Surrey Electrical Factors, Ltd., George Street, Croydon.—The statutory meeting of creditors was held recently at Croydon. Mr. C. F. Turner, one of the directors of the company, occupied the chair, and reported that the liabilities were £2,480, all due to the trade. The assets were expected to realise £1,250. The company was registered in August, 1928, and the issued capital was £600, all of which was fully paid. For a time the company was able to trade successfully, but then difficulty was experienced in the collection of accounts. Creditors began to press, and a writ was issued; it was then decided that liquidation should take place.

A resolution was passed in favour of the voluntary liquidation being continued with Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., as liquidator, together with a committee consisting of the chairman, and the representatives of the Hackbridge Cable Co., Ltd., the Weinbau Electric Co., and Messrs. Poppleton, Appleby and Hawkins. It was stated that the business premises had been closed, and that the liquidator would consult with the committee as to the realisation of the stock and the collection of the book debts.

Particulars of claims are to be sent to the liquidator by April 4th. The following are the principal creditors:—

	£		£
Acme Electric Wire Co.	55	Philips Lamps, Ltd. ...	89
Belling & Co.	57	Randon, Ltd.	356
General Accessories Co., Ltd.	194	W. Sanders & Co. ...	115
Hackbridge Cable Co.	220	Stearn Electrical Co. ...	72
Kersene Mnfg. Co. ...	75	C. G. F. Turfity	74
Perfecta Seamless Steel Co.	77	Vandam & Co., Ltd. ...	53
		Weinbaum Incandescent and Electrical Co.	110

Electric Sweepers, Ltd.—Winding up voluntarily. Liquidator, Sir J. D. A. A. Makgill, Bart., 53, Seymour Street, W.

[In this connection attention is drawn to the notice regarding the registration of Hamilton Beach Sweepers, Ltd., on p. 506 of this issue.]

British Telegraphone Co., Ltd.—A meeting of members is called for April 10th at Trafalgar House, 11, Waterloo Place, S.W., to hear an account of the winding up from the liquidators, Messrs. J. Gardiner and H. V. Creighton.

Private Arrangements.

Symphony Gramophone & Radio Co., Ltd.—At a meeting of creditors on February 28th a scheme was put forward. This provided that a committee should be appointed, and that the company should pay in cash all creditors whose claims were £10 or less in two months from the date of the scheme becoming operative. The company was to pay in cash all preferential or essential service creditors, and pay in cash to the other unsecured creditors, other than Symphony (Foreign), Ltd., 5s. in the £ within two months, and to issue second debenture stock to the creditors. For the purpose of providing working capital, the company would create 6 per cent. first debentures to an aggregate amount not exceeding £50,000, to be a floating charge upon the whole of the company's undertaking and property. It was shown that there were trade creditors for approximately £44,664. Symphony (Foreign), Ltd., was put down as creditor for £13,579; royalties due, £10,464; a cash advance by Mr. D. M. Davies, £1,400; and contingent claims on contract approximately £41,000. The issued and fully paid up capital of the company was £189,958. It was resolved that the scheme should be approved, subject to the shareholders guaranteeing to the satisfaction of the committee the £50,000 within a period of fourteen days.

Dissolution of Partnership.

A. D. Barton & Co., welding and radio engineers, 82, High Street, Camden Town, N.W.—Mr. A. D. Barton and Mr. W. R. Jones have dissolved partnership. Mr. Jones will attend to debts and continue the business.

Projected Power Station at Valparaiso.

The Municipality of Valparaiso has in view a comprehensive scheme for the laying-out of 500 acres on the outskirts of the town as an industrial district. A large steam power station is to be installed and tenders will shortly be invited for its construction.—*Reuter's Trade Service* (Valparaiso).

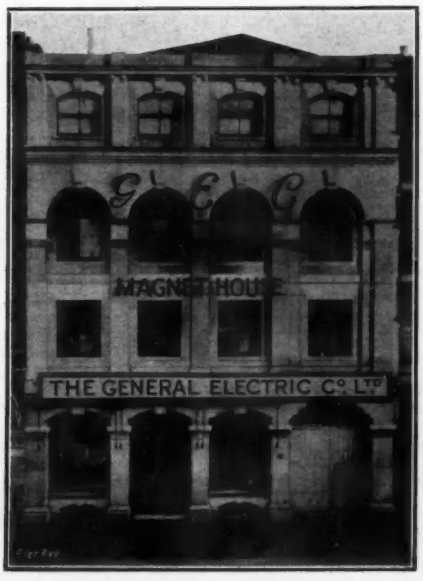
Cable Manufacture in Australia.

Following upon our Australian article last week, in which the subject of the establishment of factories in the Commonwealth by British manufacturers was touched upon, it is interesting to learn from *Reuter* (Sydney) that as the result of negotiations between the Cable Makers' Association, the Dunlop Perdriau Rubber Co., Ltd., and Metal Manufacturers, Ltd., an up-to-date plant is to be installed in Australia to manufacture insulated cables.

The G.E.C. Bristol Branch.

The continued business expansion of the General Electric Co., Ltd., in the Bristol area has necessitated the taking over of more extensive premises in that city, and on March 5th, the new branch was formally inaugurated by Alderman A. A. Senington, of Bristol Corporation, at 26, Victoria Street, Bristol. The new Magnet House consists of four large main floors, with an extension at the back of the ground floor, which houses the general and departmental offices, &c. There is also a spacious basement floor, suitable for stores, which runs under the entire ground floor and extension. The building has an imposing frontage with two display windows on either side of the main entrance in which the apparatus exhibited is shown to advantage by modern methods of shop window lighting. A separate entrance has been provided for goods delivery. The wireless showroom to the left of the main entrance—suggesting the Tudor period—has a complete range of "Gecophone" sets, loud-speakers and h.t. units on show, all available for demonstration purposes. A room abutting on the wireless showroom is devoted chiefly to a display of lighter forms of electrical engineering production and includes fractional h.p. motors, switchgear, distribution and cut-out boards, measuring instruments and electric drills. Panels on the wall are occupied by sundry components used in connection with these particular products. A third showroom on the ground floor is allocated primarily to matters concerned with illuminating engineering, and showcases depicting the constituent parts of "Osram" lamps and exhibits of the "simplified line" of "Osram" pearl lamps all serve an educational purpose. Stage-lighting equipment and examples of "sunlight" lamps are other features of the permanent display. A "Lecco" exerciser and a range of "Magnet" cookers also find a place in this showroom. A spacious and attractively laid-out landing at the top of the stairway leading from the ground floor gives access to the lighting fittings showrooms, the model electric kitchen and the manager's private office. The fittings showrooms have been sub-divided into three sections allowing period types and different classes of fittings to be kept distinct and apart. The range of fittings and fixtures presented in these showrooms is representative of various historical periods as well as modern designs, embracing pendants, electroliers, brackets, ceiling fixtures, standards, silk, vellum and glass-

Fires and Lighting Fittings.



The Front of the Building.

The Radio Showroom.

Some Views of the New Premises of the General Electric Co., Ltd., at Bristol.

ware shades, &c. A comprehensive range of electric fires is also exhibited. The equipment of the electric kitchen comprises everything electrical that can be regarded as contributing to cleanliness, comfort, &c., the display including a "Magnet" standard cooker, a small cooker, warming plates and grills, electric kettles and coffee percolators, while an electric storage water heater is affixed adjacent to a sink. The lighting fittings are of the totally-enclosed type. An inquiry bureau and waiting room are situated immediately to the right of the main entrance. Beyond them is the trade counter, annexed to which are the general offices. The whole of the upper part of the building is assigned to stock of the lighter type, such as lamps and valves, while the store room in the basement is for conduit tubing, cable and flexible, wireless sets and components, &c. The premises are regarded as adequate to serve the requirements of the branch for several years to come.

Speaking at the inaugural luncheon, Alderman Senington referred to the progress of the electrical industry in recent years and the prospects of its future extension. Mr. F. Winstanley, a director of the G.E.C., said that they were celebrating the 21st birthday of the Bristol branch, which was the first sub-branch opened by the company. The manager of the Bristol branch is Mr. W. L. Richards.

Overseas Trade Development.

In the House of Commons last week, Mr. Gillett, Parliamentary Secretary to the Department of Overseas Trade, announced that the Government proposed to create eight new posts in the Commercial Diplomatic Service for the following countries:—Argentina, Brazil, Colombia, Egypt, China (Manchuria), Persia, Finland and Switzerland. It was also intended to open new Trade Commissioner posts at Montreal and Durban. Although, in the first place, consideration would be given to members of the Commercial Diplomatic Service in filling the new positions, it had been decided to consider applications from suitable men outside the Government service.

The Canadian Electrical Code.

The Senior Trade Commissioner in Canada and Newfoundland has forwarded to the Department of Overseas Trade copies of the Canadian Electrical Code, Part 1, Second Edition, giving the essential requirements of minimum standards governing electrical installations for buildings, structures, and premises in Canada at voltages up to 5,000. A copy of the Code is available for inspection at the Department, 35, Old Queen Street, S.W.1, while the Department will obtain further copies on behalf of firms, at a cost of 1s. 3d. each.

Proposed Australian Tariff Increase.

It is reported that the Commonwealth Government is considering the imposition of surcharge ranging from 10 to 15 per cent. upon all items of the Customs tariff as a means of reducing the adverse trade balance. The Australian Association of British Manufacturers has forwarded a strong protest against the proposal to Mr. Scullin, the Prime Minister.

New Trolley 'Buses.

The Associated Equipment Co., Ltd., and the English Electric Co., Ltd., have arranged to collaborate in putting on the market a line of single-motor low-loading trolley omnibuses. These vehicles, which will shortly be put on test, will have as their basis the A. E. C. "Regal," "Regent" (4 wheel), and "Renown" (6 wheel) chassis. The line of vehicles will include single and double-deck types, with three sizes of wheelbase and seating capacity. The Associated Equipment Co. will manufacture the chassis and components of the new vehicles. The electrical equipment and the 'bus bodies will be manufactured by the English Electric Co.

Electricity v. Gas at Monmouth.

As we have reported, the Monmouth Town Council has transferred its electricity undertaking to the newly-formed Monmouth Electricity Co. A clause in the sale agreement is to the effect that "the borough will on all occasions promote the use of electrical energy in all its buildings, schools, and works and undertakings, and will assist the transferees in extending the use of electricity." In a public letter, the local gas company has taken exception to this clause, maintaining that the Town Council should treat electricity and gas on level terms.

Local Exhibition.

Birkenshaw.—Following a recent successful electrical exhibition at Birstall, the Electrical Distribution of Yorkshire, Ltd., held a similar exhibition in the neighbouring district of Birkenshaw during the week ended March 1st. The exhibition was well attended, and great interest was taken in the cooking and washing demonstrations which were given daily.

Unemployment.

A further increase of 15,359 in the number of registered unemployed was recorded during the week ended February 24th. At that date the total was 1,539,300, as compared with 1,523,941 on February 17th, and 1,391,861 on February 25th, 1929.

Standardisation of Supply Pressure.

At a recent meeting of the Council of the Electrical Contractors' Association the following resolution, put forward by Mr. R. Grierson, was adopted, and it was decided that the attention of the Institution of Electrical Engineers and Electricity Commissioners should be drawn to the matter:—"That the Electrical Contractors' Association regrets to note that little, or no, visible progress is being made towards the standardisation of the pressure of consumers, and invites the Institution of Electrical Engineers to consider the desirability of calling a conference of all branches of the industry concerned, *e.g.*, Electricity Commissioners; consulting engineers; manufacturers of plant, equipment, lamps, domestic appliances, &c.; supply authorities; installation engineers; technical Press; E.D.A., &c., to discuss the steps that can be taken to achieve the standardisation of pressures at 230 and 400 V a.c., and 230 and 460 V d.c. within a period of two or three years."

Book Notices.

"The Anglo-American Year Book, 1930." Edited by H. Russell Amery. Pp. xxvii+590. London: American Chamber of Commerce in London, Inc. Price 15s. net.—The 1930 edition of this useful Year Book contains an alphabetical commercial directory of over 7,000 names and addresses of principal firms, together with their agents, representatives or affiliated houses in England or America. It includes all Anglo-American institutions in Great Britain, with a list of officers and activities for 1929-30. Important additions to the new edition are articles on "British Business in the U.S.A." by D. Campbell Lee, and on American Consular invoice regulations. A preface has also been contributed by General Dawes. A number of special articles included in last year's book again appear, having been brought up to date.

We have received from Messrs. G. & J. Weir, Ltd., Cathcart, Glasgow, a neat diary for 1930, bound in blue morocco leather.

Trade Announcements.

Messrs. Wm. Sanders & Co., Wednesbury, have appointed Mr. W. Kirtley, M.I.Mech.E., of 8, Beverley Terrace, Cullercoats, Northumberland, as their representative for the North-East Coast.

The Electrical Distribution of Yorkshire, Ltd., has opened offices and showrooms in Barnsley Road, Cudworth.

The Yorkshire (West Riding) Electric Tramways Co., Ltd., on March 3rd, opened new electrical showrooms in Market Place, Pontefract.

Messrs. Frost & Evans, who were mentioned in our "Trade Announcements" last week, ask us to state that business is being conducted from 54, Clerkenwell Road, E.C.1.

Mr. M. C. Toner, North-Eastern Counties representative of Holophane, Ltd., has removed from 113, Belle Vue Road, to 18, Victoria Terrace, Belle Vue Road, Leeds.

The Horstmann Gear Co., Ltd., Bath, has appointed Mr. E. Glover Clark as its North of England representative.

For Sale.

Swindon Corporation invites tenders for the purchase of complete generating station equipment at the Corporation Street station, which is now out of commission. Ormskirk Union Guardians invite tenders for the purchase of a storage battery and booster. Haslingden Corporation Tramways Department has for disposal one 200-kW rotary convertor, one 100-kW rotary convertor, a Highfield reversible booster, and a loco type steam tramway engine. Messrs. Henry Butcher and Co. will sell by auction on April 3rd, at Caledonian Road, N., two leasehold factories at 3 and 14, Brewery Road, N.7. Mr. Henry J. Shaw will sell by auction on March 19th at 39, High Holborn, W.C., wireless and electrical stocks. (See our advertisement pages to-day.)

Prices of Raw Materials.

Messrs. F. Smith & Co. and Messrs. James & Shakespeare report, March 11th: No change in copper prices.

Messrs. James & Shakespeare report, March 11th: English pig lead, £20, 25s. dec.

Messrs. Edward Till & Co. report, March 11th: India-rubber, Para fine, 8¾d., ¼d. dec.

Messrs. James Forster & Co., reporting on March 8th, state that the lead market has got out of the control of the Lead Producers' Association and is rapidly approaching the level which should have been reached some months ago had prices not been artificially kept up to an uneconomic level. "As the situation is at present, there is no knowing to what level the price will fall, but, based on the present price of spelter and silver, £15 per ton would not be out of the way for lead. . . . The basic fact is that lead to-day is heavily over-produced, and only a cut in production will remedy the position and prevent things going from bad to worse."

The Timber Market.

Our Timber Trade Correspondent says that the consumption of wood has been of a most satisfactory character as regards volume, but owing to large stocks on hand, competition is most keen and prices are cut very fine. Hardwoods in the log are in quiet demand, limited supply, and with prices generally firm, especially for East Indian teak. Of cut wood, however, large shipments have come forward from the U.S.A., and prices on the whole lack steadiness. The exhibition of Australian hardwoods at Australia House, London, is a reminder to those engaged in the manufacture of wireless cabinets that they have a large variety of Empire woods to choose from.

Lighting and Power Notes.

Accrington.—EXTENSIONS.—Sanction has been obtained to the borrowing of £3,135 for the purpose of carrying out a scheme for extending the electricity supply system, and £50,000 for mains extensions.

Ashford (Kent).—RURAL MAINS EXTENSIONS.—The Urban District Council has decided to carry out mains extensions in the rural area subject to an unemployment grant. The extensions include the laying of mains to Charing and Little Chart at a cost of £15,000, to the new housing estate at Kingsnorth at an outlay of £2,850, to Mersham at a cost of £3,000, and to Sevington at an outlay of £1,400.

Australia.—VICTORIA.—According to the *Melbourne Argus*, plans have been completed for the supply of electricity in Victoria to meet all expected demands until the end of 1935, and further arrangements are now being made by the State Electricity Commission to meet requirements after 1935. The two plans most favoured are a further development of the Yallourn brown coal deposits, with further power-house extensions, and the development of natural water-power resources hitherto untouched. The development of mountain streams in the Kiewa Valley, which was the subject of a long report ten years ago, and was abandoned in favour of the present Yallourn project, is the foremost of the hydro-electric schemes now under consideration.

Ayrshire.—TRANSFER OF UNDERTAKINGS.—An agreement has been arrived at between the Ayrshire Electricity Board and the West Kilbride Electric and Lighting Co., Ltd., whereby the local undertaking will be transferred to the Board on May 15th next. From that date the price of electricity for lighting purposes will be reduced from 10d. to the uniform rate of 5½d. per kWh, with corresponding reductions for heating and power purposes.

Barnoldswick.—TRANSFER OF UNDERTAKING.—The electricity undertaking was officially handed over to the Urban District Council on March 6th. The ceremony was performed by Mr. S. Naylor, Nelson's electrical engineer, which town supplies Barnoldswick with electricity in bulk. The Council and other public bodies were the guests of the Pirelli-General Cable Works, Ltd., at dinner.

Barrow.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains to Lindale, Kirkby Slate Quarries, Foxfield and Broughton, at an estimated cost of £8,217.

Birkenhead.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £25,000 in respect of mains and services under the Wirral and Neston Electricity Special Order.

Birmingham.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £740,000 for sub-station buildings, equipment, mains and plant.

Blackburn.—MAINS EXTENSIONS.—The borough electrical engineer has been authorised to lay mains on Whitebirk housing estate, at an estimated cost of £1,554.

Blackpool.—ELECTRICITY SUPPLY EXTENSIONS.—The Corporation Finance Committee is applying for sanction to the borrowing of £8,000 for the extension of the electricity supply to Hardhorn and Singleton.

Bradford.—CHANGE-OVER.—The Corporation Electricity Committee recommends the change-over of the system of supply from d.c. to a.c. in the Horton Grange Road district at an estimated cost of £16,712.

Burnley.—CHANGE-OVER.—The Town Council has decided to change the supply of electricity in various districts from d.c. to a.c. at a cost of £47,074. The scheme is subject to a grant from the Unemployment Grants Committee.

Chesterfield.—ALTERNATIVE DOMESTIC TARIFF.—The Electricity Committee has recommended the adoption of an alternative charge for domestic supply with a quarterly standing charge based on 40s. per annum per 100 kWh used during the previous year for lighting purposes, plus ¾d. per kWh consumed. In the case of supplies by prepayment meter an additional ¼d. per kWh for meter rent will be charged, and for assisted wiring supplies an additional charge of 1½d. per kWh until an aggregate of 1,000 kWh has been consumed.

Continental.—FRANCE.—The *Journal Officiel* gives particulars of an authorisation given by the French Ministry of Public Works to the Société Bourguignonne d'Electricité for the construction and exploitation of a distribution system in the departments of Côte d'Or and Haute Saône. The supply will be obtained from sources already in existence. Particulars are also published of a similar concession for the department of Meurthe et Moselle given to the Société des Usines Jeanmaire.

Crewe.—LOAN.—The Town Council has decided to apply for sanction to a loan for electricity developments, including £4,000 for lighting cables for private houses in streets not now supplied, £1,150 for a new cable from the works to the Royal Hotel, and £6,975 for extensions to the works.

Derby.—CHANGE-OVER.—The Corporation Electricity Committee recommends that application be made to the Electricity Commissioners for sanction to change-over from d.c. to a.c., and to borrow £21,000 in connection therewith.

Dorking.—SPECIAL ORDER INQUIRY.—As a result of the inquiry held on July 19th last into an application for a Special Order permitting the formation of the Dorking Electricity Supply Co., Ltd., which proposes to take over the present electricity undertaking in Dorking, the Minister of Transport states that he is not fully satisfied that the proposals of the Order as it stands are in the best interests of the development of the electricity supply in Dorking and neighbouring areas, and has asked the Electricity Commissioners to discuss the position with the promoters and other parties concerned with a view to making further proposals.

Earby (Yorkshire).—LOAN SANCTIONED.—The Urban District Council has received sanction to the borrowing of a further £1,600 for the laying of new mains and the general development of the electricity undertaking.

Edinburgh.—PORTOBELLO CEREMONY.—Mr. A. A. McColl, district engineer of the Central Electricity Board in Scotland, has issued a statement regarding the provisions of the scheme now rapidly nearing completion. A joint opening ceremony is to take place on April 30th at the Portobello power station. For bold engineering, states Mr. McColl, the Central Electricity Board's scheme has few rivals anywhere in Europe or the world. The ultimate development of extensive water powers in the Northern Highlands is foreseen, and the development of water power in Kirkcudbright. With the extension, Portobello station has now cost over £2,000,000, and has a productive capacity of 117,500 kW. The electrical energy produced annually at Portobello has risen in the ten years since the present station was begun from 25,600,000 to 138,500,000 kWh. Foundations and other works have been prepared on this site to extend the station to accommodate a further 30,000-kW set.

Fleetwood.—LOANS SANCTIONED.—The Urban District Council has received sanction to the borrowing of £5,000 for meters, £3,000 for house-wiring installations for hire-purchase, and £5,000 for domestic electrical apparatus for hire.

Glasgow.—MAINS EXTENSIONS.—The Corporation Electricity Committee recommends the laying of mains at a cost of £3,539.

Godalming.—TRANSFER OF UNDERTAKING.—The Town Council has decided to withdraw its opposition to the Special Order for the transfer of the electricity undertaking from the Urban Electric Supply Co., Ltd., to the Aldershot Gas, Water and District Lighting Co. The terms include a reduction in the lighting charge to 7.7d. per kWh, and for all other purposes to 1¼d. per kWh as from midsummer next, but should the Order be delayed until Michaelmas the charges will be 7¼d. per kWh for lighting, and 1¾d. for all other purposes, with further reductions at Christmas. The charges for power are to be 1½d. per kWh next July, 1¾d. at Michaelmas, 1½d. at Christmas, 1¼d. at Easter, 1931, and 1d. in July, 1931, subject to from five to fifty per cent. discount to large day users.

Honley.—REVISION OF CHARGES.—The Urban District Council has adopted the following revised scale of charges for electrical energy:—Domestic supply: 3s. per quarter minimum service tariff, plus 3½d. per kWh for the first 120 kWh per quarter, 1d. for next 480 kWh, ¾d. for next 600, and ½d. for all energy in excess of 1,200 kWh per quarter, less 2½ per cent. for prompt payment. Industrial supply: 5s. per quarter for each h.p. installed, plus 3d. per kWh for the first 300 kWh per quarter; next 700, 2d.; next 4,000, 1½d.; next 15,000 1d.; next 10,000, 0.9d.; next 10,000, 0.8d.; next 10,000, 0.7d.; next 25,000, 0.6d.; beyond, 0.5d.; less 2½ per cent.

Irish Free State.—THE SHANNON SCHEME.—The Free State Electricity Supply Board announces that after prolonged negotiations with the Cork Electric Supply Co., Ltd., an agreement has been reached and the monopoly rights for electricity supply in the areas of Cork City and environs, including Queenstown, will pass to the Board on April 3rd next. The Electricity Supply Board has also entered into agreement to purchase the interests of the Galway Electric Co., Ltd., in electricity supply for the city of Galway. Arrangements have also been made whereby the Dublin United Tramways Co., Ltd., and Henry Ford & Son, Ltd., Cork, will take their complete requirements of electricity from the Board. These four contracts represent a total of approximately 43 million kWh per annum. Dr. McLaughlin, managing director of the Board, has expressed the hope that the tramway company will investigate the possibility of running railless cars.

Leeds.—POWER STATION EXTENSIONS.—The Corporation Electricity Committee has obtained sanction to the borrowing of £50,000 for buildings and £10,000 for plant at the Kirkstall generating station.

Liverpool.—LOANS SANCTIONED.—The Corporation Tramways and Electric Power and Lighting Committee has received sanction to loans of £4,000 in respect of ash-handling plant and builders' work at the Lister Drive Power Station No. 3;

£46,306 for buildings, civil engineering works, plant and cooling towers at the same station; and £12,475 for main transmission lines.

Isle of Man.—Electricity Supply.—The Manx Tynwald Court has given sanction to the Electric Development and Securities Trust, Ltd., to introduce a Bill for powers to supply electricity throughout the island. If the Bill is passed this session it is intended to lay mains next autumn. A bulk supply of electricity will be taken from the Douglas Corporation, and distributed by the Trust, which is an associated concern of the General Electric Co., Ltd.

London.—Shoreditch.—The Borough Council Electricity Committee recommends that application be made for sanction to the borrowing of £100,000 for electricity purposes.

Luton.—Electricity Supply Extensions.—The Town Council has applied for sanction to loans amounting to £54,349 for extending the supply to Toddington and Flitwick, and for other works in the area of supply.

Manchester.—Loans Sanctioned.—The Corporation Electricity Committee has obtained sanction to loans of £5,000 for buildings, £100,000 for mains, and £45,000 for sub-station equipment.

Midhurst.—Special Order.—The Aldershot Gas, Water, and District Lighting Co. has applied for a Special Order to supply electricity to all parts of the rural district not covered by other companies. The price scheduled is 8d. per kWh for lighting, and 2d. per kWh for power.

Nelson.—Change-over.—The Town Council is applying for sanction to the borrowing of £12,000, the estimated cost of converting consumers' appliances from d.c. to a.c.

North Redburn.—Street Lighting.—The Parish Council is to provide electric street lighting in the village of Howden-le-Wear at a cost of £600.

Nottingham.—Development Loan.—The Corporation Electricity Committee is to apply for sanction to the borrowing of £150,000 for the development of its electricity supply system.

Nuneaton.—Change-over Scheme.—The Town Council has decided to make application to the Electricity Commissioners for sanction to a loan of £14,255 for the development of its electricity supply system, and for the ultimate change-over of its system of supply from d.c. to a.c.

Plymouth.—Mains Extensions.—The Corporation Electricity Committee has sanctioned mains extensions in 21 streets at a total cost of nearly £4,500.

Hospital Installation.—The Corporation Hospital Committee is applying for sanction to a loan of £2,200 for the provision of a new battery house and plant at the mental hospital.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Gainsborough.—Lighting flat rate: From 9d. to 6½d. per kWh.

Burnley.—Traction: From 1.3d. to 1.1d. per kWh. Industrial tariff: First 250 kWh per quarter, from 2d. to 1½d. per kWh; next 750 kWh, from 1½d. to 1¼d.; next 4,000 kWh, from 1¼d. to 1d.; over 5,000 kWh, from 1d. to ¾d. per kWh. Domestic tariff: A fixed charge based on the rateable value plus ¾d. per kWh consumed. The rateable value basis ranges from 20 to 5 per cent. in the place of 20 to 10 per cent.

Southampton.—Lighting: Within the borough: From 4d. to 3½d. per kWh; outside the borough, exclusive of Netley Village and Hamble, from 4½d. to 4d. per kWh; and for the other two districts, from 5d. to 4d., with sliding scales both inside and outside the borough for large users. Late shop-window lighting: 2d. per kWh within the borough and 2½d. outside. Heating and cooking, outside the borough: From 1¼d. to 1¼d. per kWh. Power, within the borough: From 1½d. to 1¼d. per kWh; outside the borough: 1¾d. per kWh, with sliding scale for large users. Public lighting outside the borough: To 3d. per kWh.

Hindley.—Lighting: To 4d. per kWh. Heating: To 1½d. per kWh. Power: To 1½d. per kWh for the first 2,000 kWh, and to 1¼d. for energy consumed in excess of this amount.

Bedfordshire, Cambridgeshire & Huntingdonshire Electricity Co.—Lighting flat rate: From 10d. to 9d. per kWh. Contract rate for domestic purposes: A reduction of 9 per cent. in the fixed charge; "unit charge" from 1¼d. to ¾d. per unit during the six summer months.

Ripon.—Electricity Supply.—The Corporation Electricity Committee has asked the engineer to prepare a scheme for the electrification of the Ure Bank area with a view, if desired, to its extension to Wath and Melmerby at a later date. The Committee has decided to extend mains in the Clotherholme area at a cost of £400.

Sheffield.—Supply Extension Schemes.—The Corporation Electricity Committee has authorised mains extensions at a cost of £6,184, and has obtained sanction to the borrowing of £632 for the erection of a sub-station in Woodseats Road. In addition the Committee is seeking grants in respect of works proposed to be carried out in acceleration of normal development, comprising the change-over of existing single- and two-phase mains to three-phase mains in various districts, and the extension of mains in anticipation of future development, at a total estimated cost of £88,469.

South Shields.—Assisted Wiring Scheme.—The Corporation Electricity Committee is applying for sanction to a further loan of £5,000 for the assisted wiring scheme.

Torquay.—Power Station Extensions.—The Corporation Electricity Committee has received sanction to the borrowing of £60,000 in respect of boiler extensions at the generating station.

Watford.—Mains Extensions.—The Town Council has decided to apply for an unemployment grant in connection with a scheme for extending the mains at an estimated cost of £20,000. Certain sections of existing mains are to be re-laid at an estimated cost of £4,000, which will be met without a loan.

Tramway and Railway Notes.

Argentina.—Buenos Aires.—According to the *Review of the River Plate*, large sums of money have been spent by the Buenos Aires Great Southern Railway in testing and in giving a practical application of a new system of electric traction which, it is stated, may go far towards revolutionising this class of transport. Ing. Saccaggio, chief mechanical engineer of the Southern Railway, was responsible for the design of the new vehicles with which the first public trial run was to be made recently.

Bradford.—Railless Cars.—The Corporation Tramways Committee has received sanction to the borrowing of £15,580 for the conversion of the tramways from Five Lane Ends to Idle to the railless-car system. The Corporation is also applying for sanction to run railless-car services from Bailiff Bridge to Hipperholme; through Calverley to Farsley and Pudsey; and to Birkenshaw. The Ministry of Transport some time ago sanctioned most of an application in respect of 40 routes outside the city boundaries, but the four routes now concerned were objected to, and the Corporation is seeking to secure a reversal of the objection.

Continental.—Belgium.—A scheme put forward in 1926 for the construction of an underground electric railway between the Nord and Midi Railway stations in Brussels is reported to be again under consideration.

Switzerland.—The chief engineer of the municipal electric tramway system of Zurich has sent us a copy of his traffic returns for the past year. The city now has nearly 32 miles of electric tramways representing about 64 miles of track. The number of passengers carried increased from 71,472,303 in 1928 to 78,283,429 last year, and the car-miles run from 10,211,847 to 10,735,390. The receipts from passengers amounted to £647,138, as compared with £592,124, and the average receipts per car-mile were 14.4d., as against 13.9d. The working expenses also increased from £450,450 to £483,676.

Poland.—At a meeting recently held in Warsaw, Mr. Straszewski, engineer-director of the Pruszkow regional power station in that city, read an instructive paper on electrification progress in Poland. He stated that only eleven towns in the country had so far been equipped with electric tramways, and that there were at least four other important towns not yet provided with them. Electric suburban railways existed only in the outskirts of Warsaw, Lodz, in Polish Silesia, and in the Dombrowa mining district. No new electric tramways had been built during the past ten years; what progress had been made consisted of about 75 miles of extensions of suburban railways in the Warsaw area and 25 miles in the Lodz district. A new suburban line had also been built from Warsaw and Grodzisk, about 20 miles, and one in the Dombrowa mining area of about 12 miles. At the present time there were altogether about 280 miles of electric tramways and 120 miles of suburban railways in Poland. Schemes for the electrification of further steam-operated suburban lines in the Warsaw district and for a new electric railway between Drohabyez and Boryslaw, in the Polish petroleum district, were under consideration. Although none of the Polish main-line railways had so far been converted to electric traction, the Ministry of Communications was considering electrifying a section in the Warsaw district in connection with a scheme for the construction of a new central railway station in Warsaw and a tunnel under the city. If that project materialised, it would necessitate the construction of a new electric power station of a capacity of about 100,000 kW in the neighbourhood of the Polish capital.

Great Western Railway Co.—Colour Light Signalling.—An installation of colour light signalling between Paddington and Southall (West Junction) has been authorised by the G.W.R. Co. under the Government relief of unemployment scheme. This will necessitate the manufacture and erection of large quantities of signalling apparatus, which will comprise over 400 sets of light signals, complete with control relays, check locks, lever circuit controllers, repeaters, and transformers. All facing-points on the main and relief lines will be equipped with electric detection.

Hull.—Tramway Dispute Settled.—The dispute between the Town Council and the 115 volunteers who were engaged by

the Tramways Department during the general strike of 1926, and were threatened with dismissal in December last was settled on March 6th. The volunteers have accordingly withdrawn their case against the Corporation in the High Court.

Middlesex.—RENEWAL OF LEASE.—The County Council has agreed to extend the lease of its tramways to the Metropolitan Electric Tramways, Ltd., for a further period of 42 years.

Motherwell and Wishaw.—TRAMWAY ABANDONMENT.—At a meeting of the Town Council held recently a letter was read from the Tramways Company stating that the company intended to apply for an Order to abandon the tramways.

Ossett.—RAILLESS CARS.—At a recent meeting of the Corporation Highways Committee the question of the substitution of railless cars for the existing tramway system from Ossett to Dewsbury was discussed. The Committee decided in favour of railless cars and is to continue its negotiations with the National Electric Construction Co., Ltd., and the Dewsbury Corporation.

Scottish Tramways & Transport Association.—ANNUAL CONFERENCE.—The annual conference of the Association is to be held on May 23rd and 24th at the Atholl Palace Hotel Hydro, Pitlochry.

Stalybridge.—TRAMWAY ABANDONMENT.—The tramway service between Ashton and Mossley has now been replaced by motor-omnibuses.

Torquay.—RAILLESS CARS.—The Torquay Tramways Co., Ltd., is to make application to Parliament for sanction to run railless cars in the borough of Torquay and the urban district of Paignton.

Telegraph and Telephone Notes.

Canada.—TELEPHONE DEVELOPMENT.—The High Commissioner of Canada in London has received from Ottawa the Dominion Bureau of Statistics Report for 1928 on Telephone Statistics, from which it appears that the number of instruments in use increased by 6 per cent. during that year. The total number installed was 1,334,534, an average of 13.82 per 100 of the population. Canada is second among the nations of the world in utilisation, her average being exceeded only by that of the United States, which was 15.8 per 100 in 1927. Wire mileage was 3,982,867, pole line mileage totalling 207,566, including 4,546 miles of underground conduit.

Germany.—SHIP-SHORE TELEPHONY.—The two new North German Lloyd Co.'s 50,000-ton liners, *Bremen* and *Europa*, spoke to each other by wireless telephone last week over a distance of nearly 2,500 miles when the former was a little way out from New York and the latter was undergoing her trials in the North Sea. Communication between the two vessels was good and passengers in the *Europa* also spoke to subscribers in various parts of Germany. Telegraph communication was also established with the *Colombus* (32,000 tons) which was in the neighbourhood of Bombay.

Hull.—NEW EXCHANGE.—The Corporation Telephones Committee has asked the city architect to prepare working drawings of and invite tenders for the erection of a telephone exchange at Hedon.

KIOSK LIGHTING.—Some 31 street kiosks in the city are to be equipped with electric light at a cost of £634, the upkeep of which will cost about £1 per kiosk per year.

Sweden.—TELEPHONY.—The Swedish telephone system, which this year celebrates its fiftieth anniversary and is now entirely managed as a Government department, recently put its 500,000th telephone into use. There are 84 telephones for every thousand inhabitants, and Stockholm is the second town of the world, coming after San Francisco, as regards the proportion of the number of inhabitants and number of telephones.—*Reuter's Trade Service* (Stockholm).

The Telephone Service.—LARGE EXCHANGE.—Telephone House, Manchester's new exchange, when complete with its three automatic exchanges and an auto-manual, will be one of the largest telephone exchanges in Europe. Actually, the building is not in Manchester at all, but in the adjoining borough of Salford. It has nine storeys and five acres of floor space, all of which will be needed for the plant and staff. Three main automatic exchanges will eventually be accommodated on the first three floors; at present chief attention is being concentrated on the auto-manual and toll switchboards, which will work in conjunction with three automatic exchanges to be opened in the suburbs early this year. The automatic apparatus will include a full subscribers' unit of 10,000 lines, manual equipment for dealing with special fee calls and inquiries, and auto-manual equipment for handling traffic from manual exchanges.

BIRMINGHAM PROGRESS.—The annual report prepared for the local Advisory Committee shows that the Birmingham district (Mr. R. A. Weaver, superintending engineer) during 1929 was served by 83 exchanges; two new ones were opened, one of them being the first rural automatic exchange in the area. The equipment at 15 exchanges was extended and other additions were in hand. Preparations for conversion to automatic switching were proceeding in the Birmingham and Wolverhampton areas and conversion has already taken place at Walsall and Dudley. The number of telephones increased by 7.74 per cent. to 73,627. The number of private branch exchanges was 3,666, with 27,264 working stations. Three additional automatic private branch exchanges were installed, making the total 49. The demand for residential service was maintained, 1,776 new stations raising the total to 14,862. During the year 31 rural call offices were installed to serve outlying areas. The number of kiosks from which continuous service was available increased to 505; the total number of call offices in the district was 882. In the local exchanges 58,552,174 calls, including short-distance trunk calls, were originated in the district during the year, an increase of 2,490,497, while long-distance calls controlled at the trunk exchange increased from 4,086,950 to 4,413,924. The number of phonograms dealt with was 853,553, an increase of 33,575. Plant conditions were generally adequate. A grand total of 291,004 miles of underground wires was in use in the Birmingham area, and during the year 1,715 miles of overhead wires was erected, the total being 24,599 miles.

U.S.A.—TELEPHONE SERVICE.—The Bell telephone system, which means the American Telegraph and Telephone Company and all its subsidiary and associated companies, is the first company in the world whose asset value has reached the four thousand million dollar (£800,000,000) mark. According to the annual report for 1929 it has nearly half a million employés, almost the same number of shareholders, and its total assets are worth 4,228,430,088 dollars (£845,686,018). The report further claims that only two errors were made in every hundred calls put through, and that the average time between ordering a telephone and having it installed was only two days.—*Reuter's* (New York).

Radio Notes.

Canada.—NATIONAL SCHEME.—There are at present 81 broadcasting stations in Canada. The Government Bill which is to be presented to Parliament this session will take the control of radio out of the hands of private corporations and give it to a national company resembling the British Broadcasting Corporation. The Provincial Governments have expressed their willingness to co-operate in the scheme, and an effort will be made to supplant United States programmes with others of Canadian and British characters. It is proposed to establish seven high-power broadcasting stations to serve the nine provinces of the Dominion. The Government's Bill will follow closely the recommendations of the Dominion Radio Commission which visited Great Britain and other parts of Europe to study the systems in use there. The report estimates the cost of installation at 3,225,000 dollars, and the cost of upkeep at about 2,500,000 dollars per annum. Parliament will be asked to vote, in addition, a sum sufficient to compensate the present owners of private broadcasting stations.

LICENCE FEE TO BE RAISED.—An increase in the licence fee for receiving sets from one dollar (4s. 2d.) a year to three dollars (12s. 6d.) a year is recommended to cover the cost of upkeep.

ADVERTISING.—A reasonable proportion of time for advertising by companies using the national broadcasting stations will be allowed and revenue from this source will help to meet the cost of upkeep. Of the 81 broadcasting stations mentioned, thirteen belong to newspapers, six to grain brokers, three to religious organisations, thirteen to the Canadian National Railways, eight to radio societies and universities, fifteen to radio manufacturers and retailers, and the remainder to private individuals and manufacturing companies. There are three five-thousand-watt stations and five others above one-thousand-watt antenna input power rating.—*Reuter's* (Ottawa).

Greece.—MARCONI AGREEMENT.—An agreement with Marconi's Wireless Telegraph Co., granting it the exclusive rights for broadcasting in Greece, has been placed before the Chamber by the Minister of Communications. A vote will be taken on March 31st.

Licences.—CONTINUED INCREASE.—On March 6th, in the House of Commons, during a discussion on a Supplementary Estimate for the Post Office, Mr. Lees-Smith, Postmaster-General, said that out of the 10s. paid for a licence to the B.B.C., the Post Office took 1s. 3d. for the expenses which the collection of the licences entailed; not very much profit was made out of that part of the transaction, but it was a remarkable fact that, whereas the original Post Office estimates were founded on the assumption that the rate of increase of receiving licences would be at the rate of last year, the number for which fees were paid increased so unexpectedly in the first three months of the year that a supplementary estimate was needed. One of the causes of that increase was that the unlicensed sets were being dealt with, and a great many more licences were taken up, not only because of the prosecutions that were reported, but because it was known that the Post Office detecting agency for this purpose was at work.

Radio Exchange.—Preston.—The Preston Corporation has refused a request of Radio-by-Wire, Ltd., for permission to establish a wireless relay exchange in the borough.

Switzerland.—Regional Broadcasting Plan.—Switzerland is to have a regional broadcasting system, somewhat similar to that which is being instituted by the British Broadcasting Corporation, with three high-power stations in the German, French, and Italian-speaking sections of the country, respectively, and smaller relay stations were required in the principal towns. The most powerful of the new stations, a Marconi type P.B. transmitter, has already been ordered from Marconi's Wireless Telegraph Co., Ltd., and is to be erected at Munster, about twelve miles to the north-west of Lucerne. It will constitute the main regional station for German-speaking Switzerland, which is the largest of the three lingual sections of the country. While it is similar in design to the transmitters at Brookman's Park, the Munster station will employ greater power, 60 kilowatts in the aerial, compared with London's 30/50 kilowatts. It will thus be one of the most powerful stations in Europe, a condition rendered necessary in spite of the comparatively limited area served by the fact that Switzerland, with its valleys, high mountains, and curious screening effects, is a difficult country from the broadcasting point of view. Studios in Berne, Zurich, and Basle will serve the station, which will be allotted the wavelength of 459 metres. To provide for "crystal listeners," Marconi stations of ½ kilowatt aerial power are to be erected at Berne and Basle. They are of special design, with crystal-controlled drives to ensure constancy of frequency. The new station at Berne will replace the present Marconi 1-kW Q station that was erected in 1925, which will later be modernised and re-erected elsewhere to play a part in the regional plan. The Basle station will be the frontier town's first full-time station, the service having previously been carried out by the Marconi transmitter at the Basle aerodrome, which is primarily employed for wireless telephony with aircraft. The re-organisation of the Swiss service is expected to be completed in 1931.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

—**Argentina.**—Buenos Aires.—May 22nd. Department of Sanitary Works. Three electric pumping sets, piping and valves. (A.X. 9219.)*

Australia.—Melbourne.—April 14th. State Electricity Commission of Victoria. 22,000-V switchgear and accessories for substation "C" at Brunswick. (B.X. 6182.)*

May 5th. Supply of 22,000-V current-limiting reactors. (B.X. 6226.)*

May 12th. Supply of 22,00-V pin-type supporting insulators, for 12 months. (B.X. 6179.)*

Posts and Telegraph Department. April 1st. Submarine cable. (B.X. 6070.)*

April 15th. Cord-type switchboards. (B.X. 6135.)* Lead-covered switchboard cable. (B.X. 6202.)*

April 22nd. Braided switchboard cable. (B.X. 6201.)*

April 29th. Telephone relays. (B.X. 6157.)* P.A.B.X. relay sets. (B.X. 6158.)*

Sydney.—April 28th. Department of Public Works. Electrically-driven high lift and low lift pumping plants, &c. (A.X. 9219.)*

Bexhill.—April 2nd. Electricity Department. Laying and jointing of approximately 1,600 yd. 0.05 sq. in. three-phase 11,000-V cable. (See this issue.)

Bolton.—March 17th. Board of Guardians. Electric lamps required during six months ending September 30th, 1930. Particulars from S. Kinlay, clerk to Guardians, 28, Mawdsley Street, Bolton.

Bradford.—March 17th. Tramways Committee. Supply of six double-deck six-wheel electric trolley vehicles. Mr. R. H. Wilkinson, general manager, 11, Forster Square, Bradford.

Cardiff.—March 19th (corrected date). Electricity Department. Supply and delivery of e.h.p. and l.p. paper-insulated cables during twelve months commencing April 1st, 1930. (February 28th.)

Colchester.—March 17th. Electricity Department. Supply and delivery of about 11 miles of e.h.p. underground cable and about one mile of l.p. underground cable. (March 7th.)

Congleton.—Corporation. April 1st. H.p. and l.p. switchgear, transformers, kiosks, h.p. and l.p. cables, and l.p. overhead distribution. (March 7th.)

Dalkeith.—March 22nd. Town Council. Electrical work at housing scheme. Schedules from J. L. McDougal, Burgh Surveyor.

Edinburgh.—March 20th. Midlothian and Peebles District Asylum, Rosslynlee. Electrical fittings, &c. Forms from C. L. Addison-Smith, clerk, 19, Heriot Row, Edinburgh.

Egypt.—Alexandria.—March 27th. Ports and Lighthouses Administration. Electric cables. (B.X. 6199.)*

India.—March 21st. South India Railway Co., Ltd. Madras Electrification Scheme. Transformers for lighting and signalling. Specification (10s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

Liverpool.—March 28th. Electric Supply Department. Supply of twelve 1,000-kVA step-down transformers. (See this issue.)

London.—Central Electricity Board.—March 24th. Supply, delivery and erection of 33-kV and lower voltage transformers for the North-West England and North Wales Electricity Scheme. (February 28th.)

March 31st. Supply, delivery and erection of metering equipment required in the area of the North-West England and North Wales Electricity Scheme. (February 28th.)

April 7th. Supply, delivery and erection of 66-kV and lower voltage transformers. (March 7th.)

London County Council.—March 24th. Supply and erection in Blackwall tunnel of four electrically-driven exhaust propeller fans and two centrifugal blowing-fan sets. Four steel lattice girders, various steel joists, platforms, &c. (February 28th.)

March 17th. Wiring and fittings for electric lighting in a block of dwellings known as Broxholme House, Harwood Road site, Fulham, consisting of about 425 wiring points. (March 7th.)

Metropolitan Asylums Board.—March 19th. Installations of synchronised electric clocks at Joyce Green Hospital, Dartford, electric sewing machines at Southern Hospital, Dartford, and conversion of workshop power units to electricity at Darenth Training Colony, Dartford. (March 7th.)

Bethnal Green.—Borough Council. March 17th. Supply, delivery and laying of l.p. cables, pipes, &c. (February 28th.)

Manchester.—March 21st. Electricity Committee. Six months' supply of electric cooking ranges. (March 7th.)

March 17th. Central Purchasing Committee. Incandescent electric lamps required during 12 months ending June 30th, 1931. Form of tender, &c., from H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall.

Marlborough.—March 19th. Corporation. Overhead 11-kV transmission line and rectifier equipment. (See this issue.)

New Zealand.—Wellington.—April 29th. Public Works Department. One 10,000-kVA synchronous condenser and accessories. (B.X. 6034.)* Single-phase transformers and accessories. (B.X. 6035.)*

May 6th. 750-kVA transformers for Arapuni power scheme. (B.X. 6095.)*

May 13th. 110-kV transformers for Mangahao power scheme. (B.X. 6096.)*

May 27th. Supply of 110-kV suspension insulators for the Waitaki Power Scheme. (B.X. 6216.)*

May 13th. Posts and Telegraph Department. Terminal strips. (B.X. 6209.)*

Rhondda.—March 29th. Electricity Department. Supply of a.c. house service meters, cables, joint boxes, compound, cut-outs, &c. (February 21st.)

Salford.—March 20th. Union Guardians. Electric lighting installation and electric lifts for the Union infirmary and adjacent buildings. (See this issue.)

South Africa.—Cape Town.—April 2nd. Electricity Department. Five sets of electrically-driven pumps, with accessories, &c. (A.X. 9096.)*

Johannesburg.—March 27th. Municipal Council. Paper-insulated, lead-covered double steel-tape armoured and jute served cable. (B.X. 6200.)*

Turton (nr. Bolton).—March 18th. Urban District Council. Cable, meters and joint boxes, ironclad fuses, meter boards. Form of tender, &c., from Electrical Superintendent, Council Offices, Bromley Cross.

Waterford.—March 19th. County Board of Public Assistance. Electric wiring and lighting installation. Specification (deposit £2) from H. T. Spreadborough, Clifton, Yeughal.

West Ham.—March 27th. Board of Guardians. Electrical work and the laying of main and sub-main cables and wiring of the various blocks at the Central Home, Union Road, Leytonstone. (March 7th.)

West Lancashire.—March 17th. West Lancashire Rural District Council. Electric lighting scheme for parishes of Hesketh, Rufford and Tarleton. Specifications, &c. (deposit £2 2s.) from Jas. Scott, 358, Royal Liver Building, Liverpool.

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.

Contracts Closed.

Barrow.—Electricity Committee. Accepted :—
Two 50-kVA transformers (£121).—Ferranti, Ltd.

Birkenhead.—Electricity Committee. Recommended :—
Provision of overhead lines at Wirral (schedule rates).—W. T. Henley's Telegraph Works Co., Ltd.

Bradford.—Electricity Committee. Accepted :—
Radiant heat superheater for boiler at Valley Road power station.—Foster, Wheeler, Ltd.

Burton-on-Trent.—Electricity Committee. Accepted :—
Switchgear for Curzon Street sub-station (£967).—Ferguson, Pailin, Ltd.

Doncaster.—Town Council. Accepted :—
Supply of electricity to the factory of British Bemberg, Ltd., at Wheatley :—
Cables (£4,450).—Enfield Cable Works, Ltd.
Two 2,000-kVA transformers (£1,108).—Yorkshire Electric Transformer Co., Ltd.
Switchgear (£1,685).—Metropolitan-Vickers Electrical Co., Ltd.

Essex.—County Council. Accepted :—
Wireless installation at Black Notley sanatorium (£475).—Marconiphone Co., Ltd.

Forfarshire.—Education Authority. Accepted :—
Electric lighting and equipment for the extensions to the Arbroath High School (£4,149); electric wiring of the existing Arbroath High School (£905).—J. E. Fenton.

Gillingham.—Town Council. Accepted :—
Cable for the Rainham supply scheme.—Callender's Cable and Construction Co., Ltd.

Glasgow.—Finance Committee. Recommended :—
Electrical installation work at City Hall (£828).—T. B. and J. A. Mathieson.
Magistrates Committee. Recommended :—
Electric traffic signals (£129).—Barber & Colman.
Transport Committee. Accepted :—
Transformer.—English Electric Co., Ltd.
Special track work.—Edgar Allen & Co., Ltd., and Titan Trackwork Co., Ltd.
Renewal of electric lighting system at Blythswood Registration Office.— Messrs. Allan Arthur & Ure.
Electricity Committee. Accepted :—
305 meters reconditioned (£213), Measurement, Ltd.; 175 meters ditto (£118), Electrical Apparatus Co., Ltd.; five new motors, 212 new meters, new transformer, &c. (£1,409), Metropolitan-Vickers Electrical Co., Ltd.
20 new motors (£934), Lancashire Dynamo & Motor Co., Ltd.; 22 ditto (£1,551), J. P. Hall & Co.; 28 ditto (£184), British Thomson-Houston Co., Ltd.; 51 ditto (£427), A.S.E.A. Electric Ltd. (Century Motors).
Three new motor hoists and one reconditioned (£462).—Herbert Morris, Ltd.

Leeds.—Electricity Committee. Accepted :—
Cables (£663), W. T. Henley's Telegraph Works Co., Ltd.; (£1,850), Croydon Cable Works, Ltd.; (£1,560), Edison Swan Cables, Ltd.; (£905), Hackbridge Cable Co., Ltd.
Transformers (£2,400).—Metropolitan-Vickers Electrical Co., Ltd.

Liverpool.—Tramways Electric Power & Lighting Committee. Accepted :—
170 street lighting poles (£1,020).—Stewarts & Lloyds, Ltd.
200 pairs tramway-rail fish-plates (£222).—Edgar Allen and Co., Ltd.

London.—LONDON COUNTY COUNCIL.—Fire Brigades Committee. Accepted :—
Experimental fire alarm system.—Standard Telephones and Cables, Ltd.
HACKNEY.—Electricity Committee. Accepted :—
Materials for repair of the main battery, Millfields Road generating station (£757).—Tudor Accumulator Co., Ltd.

Manchester.—Education Committee. Accepted :—
Electrical installations: At Old Moat Municipal School and at Green End school extensions.—John Adams, Ltd.; at Mansfield Street school extension—A. Loudon; at New Moston school extension—Seddon & Sons.
Waterworks Committee. Accepted :—
One pair travelling cableways with electrical equipment for Hawes waterworks.—J. M. Henderson & Co., Ltd.
Oil engines and generators.—Ruston & Hornsby, Ltd.

Northern Ireland.—BELFAST.—Ministry of Finance.
Twelve months' supply of electric lamps, &c.—Siemens Electric Lamps & Supplies, Ltd.

Plymouth.—Electricity Committee. Accepted :—
Cables.—British Insulated Cables, Ltd., and Derby Cables, Ltd.
Meters, a.c.—Ferranti, Ltd., and Smith Meters.
Meters, d.c.—Ferranti, Ltd.
Transformers.—British Electric Transformer Co., Ltd.

Pontefract.—Rural Council. Accepted :—
Wiring houses at Airedale for electric light (£101).—F. Burrows.

Wimbledon.—Electricity Committee. Accepted :—
L.p. switchgear equipments (£2,159).—George Ellison, Ltd.
H.p. switchgear equipments (£1,023), English Electric Co., Ltd.; (£2,627), A. Reyrolle & Co., Ltd.
One 2,000-kVA transformer (£635), Metropolitan-Vickers Electrical Co., Ltd.; Twenty 200-kVA ditto (£1,990), British Electric Transformer Co., Ltd.; one 200-kVA ditto (£119), Foster Engineering Co., Ltd.; four 1,000-kVA ditto (£1,400), Johnson & Phillips, Ltd.

Forthcoming Events.

Physical Society.—Friday, March 14th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Junior Institution of Engineers.—Friday, March 14th. 39, Victoria Street, S.W. 7.30 p.m. "An Outline of Siemens No. 50 Telephone Switching Equipment." Mr. W. A. Sallis.

Royal Institution of Great Britain.—Saturdays, 15th and 22nd March. 21, Albemarle Street, W. 3 p.m. "Atomic Nuclei and their Structure." Sir Ernest Rutherford, Pres. R.S.

Association of Supervising Electrical Engineers.—Tuesday, March 18th. Junior Institution of Engineers, 39, Victoria Street, S.W. 7.15 p.m. "Mercury Arc Rectifiers." Mr. A. M. Manighetti.

Electrical Association for Women (Bristol & District Branch).—Tuesday, March 18th. Fortt's Restaurant, Bristol. 8 p.m. Dance.

Television Society.—Tuesday, March 18th. University College, Gower Street, W.C.1. Presidential address by Prof. Sir Ambrose Fleming, F.R.S., on "The Relation of Governments to Invention.

Overhead Lines Association.—Wednesday, March 19th. Institution of Electrical Engineers, Savoy Place, W.C.2. 5.30 p.m. "Comparative Costs of Overhead and Underground Transmission Lines." Dr. A. Ekstrom.

Institute of Wireless Technology.—Wednesday, March 19th. Engineers' Club, W. 7.30 p.m. "Modern Reproducers for Record and Radio." Mr. W. M. Crook.

Institution of Electrical Engineers.—Monday, March 17th. Institution. Informal meeting. Discussion on "High-Tension Sub-station Control Gear." Mr. A. F. Harmer.
Thursday, March 20th. Institution, Savoy Place, W.C.2. 6 p.m. "The Medical and Surgical Applications of Electricity." Dr. B. Leggett.
(Irish Centre).—Thursday, March 20th. Trinity College, Dublin. 7.45 p.m. "The Practical Application of the Principles underlying the Equitable and Profitable Sale of Electrical Energy." Mr. W. J. Girvan.
(Mersey and North Wales (Liverpool) Centre).—Monday, March 17th. University, Liverpool. 7 p.m. "Machine Telegraph Systems." Mr. H. H. Harrison.
(North-Western Centre).—Tuesday, March 18th. Engineers' Club, Manchester. 7 p.m. "Voltage Control of Large Alternators." Mr. H. W. Taylor.
(Hampshire Sub-Centre).—Thursday, March 20th. University College, Southampton. 7.30 p.m. Short papers.
(Sheffield Sub-Centre).—Wednesday, March 19th. Royal Victoria Hotel, Sheffield. 7.30 p.m. Ordinary meeting.
(North-Eastern Students' Section.)—Friday, March 21st. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "A Survey of Switch and Control Arrangements with Examples of Modern Practice." Mr. J. Bennett and Mr. O. A. Chrisp.
(Scottish Students' Section).—Tuesday, March 18th. Heriot Watt College, Edinburgh. 7.15 p.m. "Transformer Cooling Problems." Mr. L. B. Torond.
(London Students' Section).—Tuesday, March 18th. Institution, Savoy Place, W.C. 6.15 p.m. "Electric Locomotives." Mr. D. J. Watkins.

Diesel Engine Users' Association.—Friday, March 21st. Caxton Hall, S.W. 3.30 p.m. "The High-speed Diesel Engine." Mr. H. R. Ricardo.

Batti-Wallah's Society.—Friday, March 21st. Hotel Cecil, Strand, W.C. 7.30 p.m. to 1 a.m. Annual dinner and dance.

British Electrical Development Association.—Friday, March 21st. Royal Society of Arts, John Street, Adelphi, W.C. 7.30 p.m. Ordinary meeting.
Friday, March 21st. Savoy Hotel, Strand, W.C. Luncheon and annual meeting.

Institution of Mechanical Engineers.—Friday, March 21st. Institution, Storey's Gate, S.W. 6 p.m. "The Design and Results of a 600-lb. per sq. in. Boiler Installation." Mr. W. Nithsdale.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices:—

Adjusto-ray and Arrow radiant heat apparatus.
Caribonum carbons for H.T. batteries.

Notes.

The Batti-Wallah's Society Luncheon.

Sir Felix Pole (chairman, Associated Electrical Industries, Ltd.) was the guest of honour at the luncheon held by the Batti-Wallah's Society on March 6th at the Hotel Cecil, London. Mr. H. A. Howard, chairman of the Society, presided over about 180 members and guests.

The Chairman referred to the loss sustained by the Society in the death of the late Mr. A. A. Campbell Swinton, the company paying tribute to his memory by standing in silence. He reminded members of the annual dinner and dance to be held on March 21st. That would be the last occasion on which they would meet at the Hotel Cecil; subsequent functions would be held at the Hotel Metropole, Northumberland Avenue.

Sir Felix Pole said that he had been told he must talk about matters electrical, although, personally, he would have preferred railways as a subject for his address. He complimented the society on the part it had played in bringing about the electric propulsion of ships. He could not help being struck by certain anomalies in the industry. For example, on the one side was to be found the very highest engineering skill in design and manufacture, the products of which were the finest the world could produce, and on the other the selling of these products at prices which could only be regarded as far too low, if not unremunerative. Again, one found factories which, at least by comparison with other industries, were full of work—so full that, as Sir John Brooke recently said, the orders in hand represented a much greater horse-power than at any previous time in its history. Yet at the same time one of the largest electrical manufacturing companies was undergoing financial reconstruction. Sir Felix wondered what would be said to a suggestion that no new firm should be allowed to start the manufacture of electrical appliances without Parliamentary sanction, as in the case of electricity supply undertakings. The charter of the industry was the Report of the Weir Committee. As a result of that report, we should soon have one enormous main transmission area controlled by the Central Electricity Board. What had to be done was to bring the current into every house in the country. A very important step had been taken by the Electricity Commissioners in preparing a scheme to demonstrate the potentialities of the electricity supply in typical rural areas, viz., the Bedford demonstration scheme. The whole conception of the Bedford scheme was founded upon confidence that the public would gladly accept electric light, heat, and power if it were supplied at a reasonable price, and backed by adequate "service" to the consumer. The organisation of the Bedford Corporation undertaking, which was already selling 16 million kWh per annum, would be available. Areas which were too small to be developed economically should be absorbed by those large enough to employ adequate and properly paid staffs. The position of those small undertakings might be appreciated from realisation of the fact that of the 270 smallest undertakings not one sold more than a million kWh per annum, while the average sale was less than a quarter of a million kWh per annum; similarly 246 undertakings out of a total of 620, or 40 per cent of the undertakings in the country, had a maximum demand of less than 500 kW in 1927-28. To put it in another way, of the total kWh generated, half was supplied by 26 large stations, 45 per cent. by 152 medium stations, while the remaining 386 small stations only generated 5 per cent. of the total output. Of the maximum possible field at home we had conquered 15 per cent. In the domestic field not more than 18 per cent. of the houses were wired, and of those not one in fifty was completely electrified. Sir Felix suggested that the Society might well invite a publicity expert to give a very plain talk on salesmanship, and that there should be a collective advertisement comparing the rates charged in different towns and areas. The view had been expressed to him that all the electrical industry needed to absorb its output capacity was a full dose of modern publicity and salesmanship. If electricity supply undertakings and installation contractors spent four times as much as they did to-day on attracting new business, that would bring them not only a huge additional turnover with consequent prosperity, but the manufacturers would also benefit by an unprecedented accretion of home orders. If the manufacturers would at the same time bring their publicity and business-getting machinery at home and abroad to the same fine pitch as their workshop machinery, they would soon find themselves handling such outputs that they could afford to pay bigger dividends and at the same time reduce prices, thus strengthening their power in foreign markets. What was needed was (electrical) patriotism and publicity.

Mr. A. W. Blake (past president of the Society) thanked Sir Felix on behalf of the Society for his address.

A Medical Amplifier.

An instance of radio practice aiding medical science is revealed by experiments now being made at a maternity home attached to University College Hospital, London, whereby the doctors and nurses in charge can listen to heart beats and other faint sounds, without disturbing the patients, and are thus given the ability to study with greater ease and certainty the progress of a case. The work is being carried out by the Marconiphone Company, Ltd., which has developed a special type of microphone and amplifier for the purpose. The microphone is held in position on the patient by a broad elastic belt and connected to the amplifiers, which may be in a room adjacent to the ward, or mounted on a small trolley and wheeled to the bedside. The microphone output is taken, first, to a five-valve resistance-capacity-coupled amplifier designed to cut off at 1,000 cycles, which is connected in turn to a two-valve transformer-coupled amplifier having low gain stages. Loud-speakers or headphones can be used, as desired. Tests have shown that the apparatus is particularly successful in making the wanted sounds clearly audible, while at the same time eliminating all extraneous noises due to the patient's breathing, movement of the bedclothes, and so on. The amplification of heart beats is not new, for experiments were carried out some time ago by the Marconiphone Company with a view to simplifying diagnosis, and similar work has also been done in America.

Electro-chemical and Electro-metallurgical Industries in France.

In a paper presented to the south-west section of the Société Francaise des Electriciens, Mr. P. Bunet discusses the French electro-chemical and electro-metallurgical industries, and says that the amount of electricity produced annually in the whole of France for all purposes is at present about 15 billion kWh, of which amount these industries consume 15 per cent. The production of aluminium alone, the most important from the electrical point of view, employs 800 million kWh, at the rate of 33 kWh per kilogramme, for a production of 24,000 tons. This amount is increasing, and with the addition of new works in the Pyrenées 30,000 tons of the metal will be produced, requiring about a billion kWh. Carbide of calcium follows very closely, and the French manufacture is at present about 150,000 tons per year, consuming 600 million kWh. Iron alloys take about 300 million kWh, and electric steel employs 120 millions; chlorates take 150 millions; the production of nitrogen by the electric arc absorbs 100 millions; while the treatment by electricity of sodium, magnesium and copper, and the manufacture of abrasive materials, phosphorus, graphite, &c., are increasing in importance. The most valuable of these processes from the point of view of consumption of electricity is the manufacture of steel, for which the cost of the current is of lesser importance in relation to the value of the article produced. Even in Paris, far from the region of hydro-electric stations, electric furnaces are to be found in operation, as these furnaces are much more easy to manipulate and to control for the treatment of copper, nickel, aluminium and their alloys, than are furnaces heated by coal. The best solution from the standpoint of electric consumption is to combine the output of hydro-electric stations with stations operated by coal of poor quality, for the demands fur current made by electro-chemistry and electro-metallurgy, are very valuable in serving to regulate the varying loads created by traction, power, and light alone. In the remainder of the paper the author deals with processes to be adopted in the manufacture of chemicals with the aid of electricity, and the necessity of seeking new methods.

B.S.S. for Reversible Plugs and Sockets.

A revision of British standard specification No. 196 has just been issued by the British Engineering Standards Association, and, although the differences between the new (1930) and the 1927 edition are small, they are of interest from the manufacturing point of view. One of these differences relates to the dimensions of the lug on the non-reversible plug and socket. It has been found that, with slight irregularities in manufacture, there was a risk in some cases of being able to force the lug (the non-reversible device) into a hole in the socket not intended for the reception of this lug. A slight modification of the dimensions has therefore been made in order to remove this possibility. A few other changes, mainly of an editorial nature, have been introduced, but from a technical point of view the specification remains unaltered.

Copies of the specification, No. 196-1930, may be obtained from the Publications Department, British Engineering Standards Association, 28, Victoria Street, S.W.1, and Stand 16G3, British Industries Fair, Birmingham, price 2s. 2d. post free.

Appointments Vacant.

Assistant testing engineer for Croydon Electricity Department. Meter tester for Stockton-on-Tees Corporation Electricity Department. Switchboard attendants for Perth Electricity Department. Charge engineer and assistant shift engineer for Hull Corporation Electricity Department. (See our advertisement pages to-day.)

Correction.

The note entitled "Internal Trade and the Metric System" appearing on page 451 of our last issue should, of course, have been headed "*International Trade* and the Metric System."

Electricity in Rural Areas.

Sir Harry Haward, vice-chairman of the Electricity Commission, addressing a meeting of the Surveyors' Institution, said that the initial cost of the national scheme was estimated in 1925 at £33,500,000 (transmission network £25,000,000 and standardisation of frequency £8,500,000), but this figure would be exceeded owing mainly to the lapse of time before changing of frequency, and the difficulty of calculating the expenditure on the latter. The public would get accustomed to lines and power supporting towers, as in the case of the less sightly posts and lines of the Post Office and railways, which at one time were thought to mar the landscape. Public attention was concentrated on the effects of the gaseous fumes from large power stations, but it ignored the emissions from many smaller stations in process of being shut down, from factories, and from the coal fires of dwelling-houses. Smoke and gritf should no longer be a nuisance in a modern power station, and recent experiments went to show that the oxides of sulphur could be eliminated. In distribution the main urban areas were being adequately provided for and could look after themselves. The supplies in the smaller towns should improve with progressive management and the wider recognition by undertakers of the advantages of a two-part tariff and of the necessity for hire or hire-purchase facilities. Undertakers who had obligations to develop rural areas were addressing themselves to their task, although not all of them with equal energy. Large capital outlay was involved and was unlikely to be remunerative in the early years. The potential demand in the country districts during the next 10 years had been computed at 280,000,000 kWh.

Electricity on Poultry Farms.

Mr. H. Cowgill, of the Westgate Hill Farm, Bradford, who has a poultry farm of 15½ acres, reports good results from the use of electricity. He began the farm in 1921 with 30 fowls; his egg product that year was 4,500. Last year he had over 2,000 laying fowls, 4,000 chickens, and an output of some 320,000 eggs. The oil paraffin lamps formerly used for night feeding have been replaced by a 60-watt electric lamp and an independent switch in every hut, together with a main general switch in the residence. Later an ultra-violet-ray apparatus was installed to bring conditions more into line with those of the sunny south. This treatment is given to two broods at a time, first for two minutes when the chicks are 14 days old and subsequently for eight minutes daily, except Sundays. The electrical installation has greatly reduced labour costs, and Mr. Cowgill is about to reduce the feeding task by an electric mixer. He pays the Bradford Corporation Electricity Department, which extended a main cable 200 yards to reach the farm, an average of 0.95d. per kWh for domestic consumption and 2.08d. per kWh for supplies to the farm buildings.

Television Exhibition.

The Television Society announces that the second annual exhibition of television and other apparatus will be held at University College, London, on April 9th. Suitable exhibits can be displayed by non-members this year.

The Design of Dynamos for Automobiles.

The above subject was introduced recently at an informal meeting of the Junior Institution of Engineers by Mr. J. Rowcroft, who stated that dynamos for automobiles were often of the bi-polar variety, but the present trend of design was for four poles, as the armature windings were simplified and a smaller machine could be used to obtain the required output; that machine lent itself to mass-production methods more easily than the bi-polar one. The armatures were sometimes hand- and sometimes former-wound, and there seemed to be no appreciable difference in the service given by each system; a distinct advantage of the latter method was the more perfect mechanical balance obtained, an important consideration in those machines which had to be driven at between 3,000 and 4,500 r.p.m. As the voltage of the machines did not usually exceed 12, enamel-insulated wire could be used, taking up less room than cotton-covered wire. Excessive output at high car speeds was provided against by the third-brush method of regulation, which at high speeds tended partially to demagnetise the machine by altering the position of the magnetic lines of force passing from the field magnet poles to the armature. The field magnet coils were usually energised by half the terminal voltage of the machine, one end of the coils being connected to one pole of the dynamo and the other to the third brush.

Model Workroom Lighting.

A section of the Silk Inspection Department of the London Holeproof Hosiery Co. has recently been completely reorganised on the most up-to-date lines, and it provides a model installation for this kind of work. The workers are engaged in examining silk stockings, firstly, with a view to discovering possible flaws of manufacture, and, secondly, for accurate matching of colours. From this, and from the fact that this department is on the lower ground floor, with the consequent necessity to use artificial light during the whole working day, it is evident that the highest possible order of lighting is essential to efficient work. The lighting scheme installed by the General Electric Co., Ltd., consists of ten 150-watt "Osram" daylight blue lamps in standard dispersive reflectors. The reflectors are placed in two rows, the length of the

Lighting in a Hosiery Factory.

department, at a distance between the rows of 6 ft. 10 in., and between the reflectors of 5 ft. 2 in. The resultant illumination is an increase of over 400 per cent. on the lighting of the room before the alterations were made. The staff has been able to note a definite increase in speed and accuracy of work, and the directors have been so impressed by that fact that high-grade lighting is a first-class investment, that it is probable that improved lighting will gradually be installed in the whole of their City premises. The accompanying illustration shows the effect of the new lighting installation.

Miners' Safety Lamps.

H.M. Secretary for Mines announces that he has made an order under Section 33 of the Coal Mines Act, 1911, as amended by the Coal Mines General Regulations (Safety Lamps), 1927, approving for use in all mines to which the Act applies, subject to the conditions specified in the schedule to the order, the following (amongst other) types of safety lamps, viz.:—Electric lamps for general use: Davis-Derby cap; Derby 4-volt; Davis-Derby portable floodlight, 8-volt; Edison cap (model G); Aldwarke; Wolf Alkaline (18 and 22 ampere-hours). Electric lamps for use by officials or for special purposes only: "Ceag" gas-detecting Nos. 1 and 2; Derby Officials; "Wefco" hand torch (for auxiliary purposes). The order also amends the schedules to previous safety lamps orders by substituting revised specifications, or amending the specifications, of certain types of safety lamps already approved. Another order approves the Wolf alkaline (18 ampere-hours) miners' lamp with a Gulliford firedamp indicator attachment for use in all mines to which the Act applies, subject to the conditions specified in the schedule to the order. The indicator is so designed that a heated platinum wire may be connected in series with the lamp bulb by means of a switch; the presence of approximately 2½ per cent., or more, of firedamp in the air causes the wire to fuse and the light to be extinguished; the light may be recovered by releasing the switch. Copies of the orders can be purchased from H.M. Stationery Office.

Extensions at Ipswich.

Recent extensions at the electricity generating station at Ipswich were inaugurated by the Mayor, Councillor A. L. Clouting, on March 3rd, when he started up the new 12,500-kW Brush-Ljungstrom turbo-alternator set which, with the extension of the station—providing space for a further generator of from 25,000 to 30,000 kW—cost approximately £60,000. The new equipment includes a boiler of 53,000 lb. per hour capacity, a water-softening plant of a capacity of 1,500 gal. per hour, and a 48-in. water-circulating system to the River Orwell, with the necessary screening plant.

In welcoming the visitors, Councillor S. Charles Grimwade, chairman of the Electricity Supply Committee, mentioned that the undertaking was formally opened in November, 1903, and had fully justified itself by the results. Consumers numbered only 98 in March, 1904, and the capital expendtiure was then £70,000. At the present time consumers numbered 9,550 and the capital expenditure was £720,000. The installation had been increased from a capacity of 786 kW to 30,750 kW, and the total mileage of mains and feeders from 20 to 130. Last year the undertaking sold 22,250,000 units, as compared with 1,066,285 in 1904, while in spite of the increased cost of coal the average price per unit sold had been reduced from 1.976d. to 1.521d. He paid a tribute to the vision and foresight of the former and present engineers and managers, Mr. Frank Ayton and Mr. A. S. Black, and the staff, especially congratulating Mr. W. A. Fairhead, the station superintendent, who had been with them many years and had much to do with the planning of the extension.

The Engineering Golfing Society.

The annual general meeting of this Society took place on February 26th. The membership of the Society is restricted to members of the Institutions of Civil, Mechanical, and Electrical Engineers. Two years ago the Society presented a cup for the Northern Section which is played for annually at a meeting in the North of England or in Scotland. This was presented with a view to encouraging members in the North to join the Society. Two meetings are annually held in the London area. The secretary of the Society is Mr. H. C. Siddeley, 50, Queen Anne's Gate, S.W.1.

E.P.E.A. Joint Meeting.

After meeting at Hayle on Saturday, March 1st, the members of the Devon and Cornwall section of the Electrical Power Engineers' Association visited Camborne, where they were joined by members of the Cornish Institute of Engineers for a lecture by Mr. F. Nicholls, deputy chief engineer of the Derby Corporation Electricity Department. The chair was occupied by Mr. L. A. Hards, engineer and manager of the Cornwall Electric Power Company.

The Rationalisation of Societies.

A committee has been formed, representing twelve societies, for the purpose of building in London a home of chemistry and industry. The chairman is Sir Arnold T. Wilson, formerly Civil Commissioner in Irak, and resident director of the Anglo-Persian Oil Company in the Persian Gulf. The societies concerned are:—Institute of Mining and Metallurgy, Institution of Mining Engineers, Chemical Society, Society of Chemical Industry, Institution of Chemical Engineers, Institution of the Rubber Industry, Institution of Petroleum Experts, Institute of Fuel, Institute of Metals, Iron and Steel Institute, Faraday Society, and the Physical Society. A sum of £100,000 towards the cost of the new building has already been promised. The site will be in the neighbourhood of Tothill Street, Westminster. The Societies concerned are at present housed in various parts of London, in no less than five postal areas. They have, through their Councils, agreed in principle upon the scheme, and will pool their libraries, which will be sectionised, and the present librarians will be available, not only in that capacity, but also as heads of an information bureau. There will also be a lecture-hall, a restaurant, reading-rooms, and other facilities, so that the members, numbering 20,000 in all, will be able to meet one another in a social and informal way. Other bodies have expressed a desire to be tenants, including certain manufacturing groups.

U.S.A. Electric Vehicle Exports.

During last year 170 industrial electric motor vehicles, valued at £49,513, were exported from the United States, as compared with only 138, worth £35,511, in 1928.

Electric Silk-Moistening.

According to the *Manchester Guardian Commercial* an important new application of electricity has occurred in America in hosiery manufacturing for moistening silk before passing it through the needle knitting machines. Insulated boxes, containing water with felts for the silk to pass through, and having electric heating units absorbing 173 watts each, are placed so that from three to seven threads are moistened on their way to the needles. The water is kept at about 160 deg. F. and its evaporation moistens the felt so that the silk picks up sufficient moisture to eliminate back winding. Loads of 990 kW connected in one plant have been noted, and in the Philadelphia district approximately 2,000 kW of electrical power is accounted for by this class of business.

Electro-Harmonic Dinner.

The Liverpool and District Electro-Harmonic Society recently entertained members of the Manchester Electro-Harmonic Society at dinner and a concert at Liverpool. Mr. P. J. Robinson (Liverpool City electrical engineer), president of the Society, could not attend, as he only returned the previous day from Droitwich, where he had been receiving treatment. Mr. Sutton presided, and Mr. H. A. Pryor remarked on the fact that, while the London Society was "as dead as the dodo," the Manchester and Liverpool Societies continued to flourish, despite the fact that they did not get all the support they should from the younger members of the industry. Speeches were also made by Mr. C. E. Leak (secretary of the Manchester Electro-Harmonic Society), Mr. E. G. Pulford, jun. (secretary of the Liverpool Society), and Mr. W. H. Moore. The concert programme was quite in accord with the high standard set by the Liverpool Society.

Football by Artificial Light.

Over one million candle-power is said to have been used to illuminate the Stadium, Field Mill, Mansfield, on the occasion of the North Notts. senior cup final football match between Welbeck Athletic and Ollerton Forest. The kick-off took place at 6.30 p.m., so that the entire game was played by artificial light. Messrs. Philips Lamps, Ltd., were responsible for the illumination of the ground, and also for the radio musical programme.

The Drumm Battery.

The Irish Free State Government is considering the advancement of additional money to the company formed for the development of the Drumm electric storage battery, says the *Irish Independent*. Already £5,000 has been voted. An English expert has been called in to test what has been accomplished so far, and his opinion appears to encourage the authorities to have the invention tested.

National Coal Resources.

In connection with the Physical and Chemical Survey of the National Coal Resources, which is one of the important aspects of the Fuel Research work of the Department of Scientific and Industrial Research, the Department has recently appointed a Committee to deal with the West Yorkshire Coal Area. The object of the Survey is to investigate the characteristics of the various coal seams in the country, with a view to their utilisation to the best advantage. Local laboratories are established in each area for the examination of samples, and, when necessary, large-scale investigations are carried out at the Fuel Research Station (East Greenwich) or elsewhere. The work of each local committee is to advise as to which seams should be investigated, to recommend what large-scale work should be undertaken, and to bring to the Department's notice any problems of particular local interest which may require investigation. Arrangements are in hand for the establishment of a further laboratory to deal with the coalfields of Warwickshire, Cannock Chase and South Staffordshire and Leicestershire.

Fire at Lord Rayleigh's House.

On Friday last week a serious fire occurred at Terling Place, Essex, the home of Lord Rayleigh. It was reported that a laboratory was destroyed, involving the loss of some valuable scientific instruments and books.

Educational.

The annual general meeting of the Finsbury Technical College Old Students' Association was held at the Engineers' Club on February 24th. It was decided to utilise the interest on the money of the Finsbury Defence Fund and the Thompson Memorial Fund for a prize to be given by the Physical and Optical Society to Apprentices to commemorate the names of S. P. Thompson and Finsbury. The annual dinner of the Association will be held at the Trocadero on Saturday, March 29th. Mr. W. B. Esson, M.I.E.E., was appointed president for the coming year.

Institution of Electrical Engineers.

Informal Meeting.—At the informal meeting on Monday, March 3rd (Mr. H. T. Young in the chair), Mr. J. J. Fisher opened a discussion on "Push-button Control."

Mr. J. R. Bedford said British manufacturers always seemed to make control gear that required current flowing continuously to maintain contacts. It was, of course, quite a small current, but there were conditions under which it was quite unsuitable.

Mr. A. Morgan said the gear indicated by Mr. Bedford was obtainable, but the keynote of button control was not economy, but convenience. Ease of control was a point which electrical engineers should stress persistently.

Mr. J. Eck pointed out that push-button control eliminated many sources of trouble with motors; it prevented misuse of the starter and, by mounting the controller adjacent to the motor, it confined the circuit leads to short lengths, pilot leads being run only to the control points.

Mr. J. F. Shipley said one of the defects of contactor gear as now designed was the great space it required; he thought the double-wound rotor would simplify the control gear considerably.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. W. G. Watson, managing director of Messrs. W. G. Watson & Co., Ltd., electrical engineers, Sydney, N.S.W., is in England on a business visit for a few weeks. His address is 47, Gresham Street, E.C.2.

Leeds Corporation Electricity Committee has appointed Mr. S. F. Luckly as mechanical superintendent at a salary of £484 per annum, and Mr. R. J. Ure as electrical superintendent at a commencing salary of £300 per annum.

Lt.-Col. C. G. G. Crawley has been appointed Inspector of Wireless Telegraphy to the General Post Office in succession to Commander F. G. Loring, who recently retired after 20 years' service. Commander Loring has taken up a position with the International Marine Radio Co., Ltd.

Mr. W. E. Smith, mains foreman to the Cheadle and Gatley U.D.C., has been appointed resident electrical engineer to the Penmaenmawr U.D.C.

Mr. C. M. P. Lucas, assistant distribution engineer in the Liverpool Electric Supply Department, is about to retire on superannuation.

There were 162 applicants for the position of electrical engineer to the Cardiff Rural Council and Mr. H. Jackson, B.Sc., A.M.I.E.E., was selected. Mr. Jackson is 30 years of age. He received his electrical training with the Brush Electrical Engineering Co. and for the past eight years has been with Messrs. Walter Bridges & Co., consulting engineers of London.

Consequent upon the separation of the management of the Gas, Water and Electricity Departments of the Spalding Urban District Council as from April 1st next, Mr. Frank R. C. Roberts has been appointed engineer and manager to the Electricity Department. He was for over 13 years with the Newcastle-on-Tyne Electric Supply Co. and associated companies.

Mr. Vernon Johnson, A.M.Inst.C.E., formerly of the staff of the Yorkshire Electric Power Co., Ltd., and more recently with Synthetic Ammonia & Nitrates, Ltd., has been appointed manager for Messrs. Kettlewell, Sons & Co., Ltd., public works engineers, of Hull.

Mr. W. Ellis, engineer and manager of the Welwyn Garden City Electricity Supply Co., who has resigned his position, has been presented by the staff with an inscribed portable gramophone. His successor is Mr. A. T. Bullen, of Bedford.

The Watford Town Council has appointed Mr. J. R. Jones, of the Newport (Mon.) electricity works, as chief assistant station superintendent.

The Canterbury City Council has appointed Mr. George V. Tharle, assistant mains engineer at Portsmouth, as assistant city electrical engineer at a salary of £489 per annum.

Mr. McCartney, of Preston, who as representative of the English Electric Co., Ltd., has for some time past been engaged at the Thornbury works of the Bradford City Tramways Department, has been appointed by the Bradford Tramways Committee as first occupier of a new post, that of supervisor of railless trolley vehicle services.

With reference to a note which appeared in our "Personal Column" last week, Mr. G. B. Pierpoint says that the reason he did not accept the appointment at Chester was that he has been granted a commission in the Royal Air Force, and will join a flying school at the end of this month.

The Establishment Committee of the Chesterfield Town Council has recommended that the salary of the borough electrical engineer be increased from £800 to £850 per annum as from April 1st next.

The Torquay Corporation Electricity Committee has granted extra remuneration for special services rendered during the vacancy in the position of borough electrical engineer and during the promotion of the Torquay Electricity (Extension No. 3) Order to Messrs. T. W. Mackay, G. B. Dent, H. H. Thompson, A. J. R. Willingham and R. H. Rooke.

Mr. C. Jago Gregg, a director of Messrs. Falk, Stadelmann and Co., Ltd., has been appointed president of the Iron, Steel & Ironmongery Benevolent Association.

Mr. W. E. Smith, of the Cheadle and Gatley Electricity Department, has been appointed resident electrical engineer to the Penmaenmawr U.D.C.

Mr. B. C. Ward, distribution superintendent in the Croydon Corporation Electricity Department, has been appointed deputy borough electrical engineer to the Bermondsey Borough Council.

The Tramways Committee of the East Ham Corporation recommends the appointment of Mr. J. C. O'Niell, Barking, as traffic superintendent at a commencing salary of £325 per annum.

Mr. S. A. Williams, Assoc.A.I.E.E., has joined the engineering staff of the Bastian Meter Co., Ltd. Mr. Williams has had considerable experience in America in industrial electric heating, particularly with regard to the problems of oil and pitch heating. The company is extending its operations to cover this field.

Wills.—Sir Robert Ashton Lister, chairman and founder of R. A. Lister & Co., Ltd., left estate of the value of £308,512, with net personalty £294,982.

The late Mr. Harry Walker, of Gateshead, a director of Clarke, Chapman & Co., Ltd., and C. A. Vandervell & Co., Ltd., left estate valued at £78,631 (£75,410 net personalty).

Mr. Alfred Oscar Kolkhorst, late general manager and chief engineer of the Lisbon Electric Tramways, Ltd., left personal estate in England valued at £48,317.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

St. Helen's Bay Electricity Supply Co., Ltd.—Registered as a public company March 8th. Capital, £6,000 in £1 shares. Objects: To carry on the business of an electric light and power supply company, &c. The subscribers (each with one share) are: G. H. Webber, 179, Abbey Wood Road, Abbey Wood, S.E.2, solicitor's clerk; S. A. Pierpoint, 7, Muschamp Road, S.E., solicitor's clerk; and five others. Solicitors: J. D. Langton & Passmore, 71, Powis Street, Woolwich, S.E.18.

Rus-Sun-Ray, Ltd.—Private company. Registered March 5th. Capital £500 in 10s. shares. Objects: To manufacture, sell and distribute ultra-violet and violet-ray apparatus, together with all appliances and accessories appertaining thereto including all kinds of electrical appliances: to establish centres and clinics for treatment of light and ray therapy, &c. The directors are: W. T. Russell. "Rusrene," West Wickham, Kent, therapeutist; G. T. Melrose, 93, Richmond Road, Ilford; Lillie L. Russell, "Rusrene," West Wickham, Kent, clerk; Mary I. Melrose, 93, Richmond Road, Ilford, nurse. Secretary: G. T. Melrose. Registered office: 121, Kingsway, W.C.2.

Harlie Bros. (Edmonton), Ltd.—Private company. Registered March 6th. Capital £1,000 in £1 shares. Objects: To acquire the business of Harlie Bros. carried on by C. Watson and H. J. Camp at Balham Road, Edmonton, and to carry on the business of manufacturers of and dealers in wireless and electrical apparatus, &c. The directors are: C. Watson, 67, Cairo Road, Walthamstow, E.17; H. J. Camp, 17, Meadway, Bush Hill Park, Middlesex. Secretary: A. L. Peachey. Registered office: 3, Balham Road, Lower Edmonton, N.9.

Harlie (Equipments), Ltd.—Private company. Registered March 6th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers and repairers of all wireless apparatus, telegraphic and telephonic apparatus, electrical and magnetic instruments, kinematograph, speech, music amplification and synchronising equipments, &c. The directors are: C. Watson, 67, Cairo Road, Walthamstow, E.17; H. J. Camp, 17, Meadway, Bush Hill Park, Middlesex. Secretary: A. L. Peachey. Registered office: 5, Chiswick Road, Lower Edmonton, N.9.

Adamson & Oliverson, Ltd.—Private company. Registered March 5th. Capital, £2,000 in £1 shares. Objects: To acquire on the business of manufacturers of and dealers in wires, lamps, fittings, accumulators, batteries, dynamos, motors, magnetos, valves, telephonic and telegraphic instruments and apparatus, wireless goods, &c. The directors are: W. Adamson, 27, Cold Bath Road, Harrogate; H. G. Oliverson, 13, York Road, Harrogate. Secretary: H. G. Oliverson.

Church & Collis, Ltd.—Private company. Registered March 6th. Capital £2,000 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, manufacturers of machinery and motors, founders, engineers, &c. The first directors are: H. Church, M.C., M.I.E.E., Nabbots, Springfield, Essex, electrical engineer; S. E. Collis, 42, Hamlet Road, Chelmsford, mechanical engineer. Solicitors: Kimbers Williams & Co., 79, Lombard Street, E.C.

A. F. Bulgin & Co., Ltd.—Private company. Registered March 5th. Capital £2,000 in £1 shares. Objects: To acquire the business of a merchant of radio instruments, and manufacturer, carried on by A. F. Bulgin at 9, 10 and 11, Cursitor Street, Chancery Lane, W.C., as A. F. Bulgin & Co., and to carry on the business of wireless engineers, manufacturers of gramophones, telephones, &c. The directors are: A. F. Bulgin, Villa Rose, Christchurch Road, Ilford, radio engineer (chairman and life director); S. J. Bulgin, 109, Beehive Lane, Ilford, accountant; R. C. Bulgin, address not stated. Solicitors: Rexworthy, Barnard & Bonser, 83, Cannon Street, E.C.4.

United Utility Co., Ltd.—Private company. Registered March 3rd. Capital, £2,000 in 1,900 10 per cent. non-cumulative preference shares of £1 each, and 2,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in telephone and motor appliances and parts, &c. The subscribers are: E. McBean, 7, Avignon Road, Brockley, Kent, solicitor's clerk. Ellen M. Weller, 1, Sidney Villas, Avenue Road, Old Southgate, N.14, solicitor's clerk. Secretary (*pro tem*): E. McBean. Registered office: 12, Denman Street, W.1.

Craven Engineering Co., Ltd.—Private company. Registered March 4th. Capital £2,000 in £1 shares. Objects: To carry on the business of electrical and mechanical engineers, founders, machinists, manufacturers, and patentees of electric washers and other electrical devices for household or trade use, &c. The subscribers are: A. R. Clough, "Wheatlands," Crosshills, near Keighley, spinning manager; E. Hanson, Rhodesia Street, Crosshills, near Keighley, motor engineer. Secretary: A. R. Clough.

Radio Industries, Ltd.—Private company. Registered March 5th. Capital £10,000 in £1 shares. Objects: To carry on the business of electrical engineers, manufacturers of and dealers in wireless apparatus, radio-gramophones, &c. The subscribers are: A. L. Truscott, The Lilacs, Penns Lane, Erdington, Birmingham, accountant; A. Pryan, 153, Albert Road, Stechford, Birmingham, radio engineer. Solicitors: Cochrane & Cripwell, 55, Temple Row, Birmingham.

Perfect Battery Co., Ltd.—Private company. Registered March 3rd. Capital, £100 in £1 shares. Objects: To carry on the business of electricians, electrical engineers, manufacturers of and dealers in electrical appliances, &c. The directors are: A. S. Stewart, 27, Cholmeley Crescent, Highgate, N.; Florence A. Jones, Devon House, Surrey Road, Harrow. Registered office: 11, Fitzroy Square, W.1.

Johnson & Bolsom, Ltd.—Private company. Registered March 3rd. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless parts and accessories, television apparatus, kinema equipment, &c. The directors are: J. Bolsom, 123, Westminster Bridge Road, S.E.11 (director Red Triangle Electric Co., Ltd.); W. G. Johnson, 2a, Morpeth Terrace, S.W.1. Registered office: 37, Tothill Street, Westminster, S.W.1.

Electra Co., Ltd.—Private company. Registered February 26th in Dublin. Capital, £1,500 in £1 shares. Objects: To carry on the business of manufacturers, exporters, repairers of and dealers in electric cables, wires, lines, accumulators, lamps, fittings, accessories, &c. The subscribers are:—Edward Jean Constant Deckers, 57, Rutland Square, Dublin, electrical engineer; Arthur Cyril Taylor, 57, Rutland Square, Dublin, commercial manager.

Hughes Engineering Co. (Birmingham), Ltd.—Private company. Registered February 27th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical materials of all kinds, radio appliances, &c. The subscribers (each with one share) are: T. O. Hughes, 3, Cherry Street, Birmingham, engineer; Mrs. M. T. Young, Victoria Street, Pensnett. D. G. G. Jones, of The Leasowes, Compton, Wolverhampton, is the first director. Secretary: Mrs. M. T. Young. Registered office: 3, Cherry Street, Birmingham.

Hamilton Beach Sweepers, Ltd.—Registered as a private company March 3rd. Capital, £20,000 in 18,000 8 per cent. cumulative participating preference shares of £1 each and 8,000 ordinary shares of 5s. each. Objects: To adopt an agreement with Electric Sweepers, Ltd., and to carry on the business of manufacturers of, agents for, and dealers in electrical or other sweepers, and articles and accessories used in connection therewith, electrical or other irons, kettles, heaters, radiators, lamps and other articles of domestic use, wireless apparatus, &c. The directors are: E. O. Goss, 117, Pine Street, Waterbury, Connecticut, U.S.A. (president of the Scovill Manufacturing Co., Waterbury); Sir John D. A. A. Makgill, Bt., 53, Seymour Place, W.1 (director of Electric Sweepers, Ltd.); L. Van Herk, 93, Westeinde Voorburg, The Hague, Holland (managing director of N. V. Internationale Nautische Handel Maatschappij); V. M. Crosse, 60, Albert Hall Mansions, S.W.1 (director of Electric Sweepers, Ltd.); W. S. Nicholson, United Services Club, Pall Mall, S.W. (director of Electric Sweepers, Ltd.). Secretary: F. C. Hook. Registered office: 405, Oxford Street, W.1.

Monmouth Electricity Co., Ltd.—Registered March 6th as a public company. Capital, £25,000 in £1 shares. Objects: To carry on the business of an electric light and power company in all its branches. The first directors are: M. J. Railing, Whiteknights, Reading; L. C. Gamage, 11, John Street, Mayfair; S. D. White, "Arundel," Upper Prighton Road, Surbiton; A. W. Blake, 6, Slaverton Road, Willesden, electrical engineer. The first three named are directors of the General Electric Co., Ltd. Registered office: Magnet House, Kingsway, W.C.2.

Official Returns of Electrical Companies.

Robinson & Hands Electric Co., Ltd.—Capital, £5,000 in 20 ordinary and 4,980 preference shares of £1 each. Return dated December 26th, 1929. 20 ordinary and 4,232 preference shares taken up. £4,252 paid. Mortgages and charges, nil.

Electric Sign Co., Ltd.—Capital, £5,000 in £1 shares. Return dated October 25th, 1929. 2,000 shares taken up. £1,000 paid. £1,000 considered as paid. Mortgages and charges, nil.

Woodstock Power Syndicate, Ltd.—Capital, £10,000 in £1 shares. Return dated January 13th, 1930. 1,711 shares taken up. £1,711 paid. Mortgages and charges: £2,300.

Electroflo Meters Co., Ltd.—Capital, £21,000 in £10 shares. Return dated December 31st, 1929. 2,090 shares taken up. £10,900 paid. £10,000 considered as paid. Mortgages and charges, nil.

Halifax & Bermudas Cable Co., Ltd.—£50,000 in £5 shares. Return dated December 31st, 1929. All shares taken up. £50,000 considered as paid. Mortgages and charges, nil.

Price's Electrical Supplies, Ltd.—Capital, £3,000 in £1 shares. Return dated November 22nd, 1929. 1,210 shares taken up. £1,210 paid. Mortgages and charges, nil.

Stearn Electric Co., Ltd.—Capital, £4,000 in £1 shares. Return dated December 9th, 1929. 4,000 shares taken up. £2 paid. £3,998 considered as paid. Mortgages and charges, £9,700.

Faulkner & Co. (Manchester), Ltd.—Capital, £2,000 in £1 shares. Return dated January 4th, 1930. 1,900 shares taken up. £500 paid. £1,400 considered as paid. Mortgages and charges, nil.

Synchronome Co., Ltd.—Capital, £7,000 in 600 5 per cent. preference, 5,000 7½ per cent. non-cumulative second preference, and 1,400 ordinary shares of £1 each. Return dated December 31st, 1929. 600 first preference, 4,200 second preference, and 1,400 ordinary shares taken up. £700 paid on 600 first preference and 100 ordinary shares. £5,500 considered as paid on 4,200 second preference and 1,300 ordinary shares. Mortgages and charges, nil.

Century Electric Co., Ltd.—Capital, £5,000 in £1 shares. Return dated August 27th, 1929 (filed January 7th, 1930). 2,387 shares taken up. £2,387 paid. Mortgages and charges, nil.

Sudan Light & Power Co., Ltd.—Capital, £450,000 in 94,000 6½ per cent. cumulative preference and 356,000 ordinary shares of £1 each. Return dated December 3rd, 1929. 356,000 ordinary shares taken up. £356,000 paid. Mortgages and charges at date of return, £400,000. Return of allotments, made up to January 7th, 1930, shows a further 52,000 preference shares allotted payable in cash and fully called up.

Cross & Cross, Ltd.—Capital, £20,000 in £1 shares. Return dated September 26th (filed December 18th), 1929. 11,000 shares taken up. £5,845 paid. £5,155 considered as paid. Mortgages and charges, nil.

Wombwell Electrical Contracting Co., Ltd.—Capital, £500 in £1 shares. Return dated November 12th, 1929. 462 shares taken up. £462 paid. Mortgages and charges, nil.

Watshams, Ltd.—Capital, £10,000 in £1 shares. Return dated October 21st, 1929. 2,901 shares taken up. £2,901 paid. Mortgages and charges, nil.

A.F.A. Accumulators, Ltd.—Capital, £5,000 in £1 shares. Return dated October 31st, 1929. All shares taken up. £1,251 paid. £3,749 considered as paid. Mortgages and charges, nil.

Castellina Co. (1926), Ltd.—E. F. Wilkins, 6, Queen Street, E.C.4, was appointed receiver and manager on February 25th, 1930, under powers contained in debenture dated July 18th, 1929.

Radielle Co., Ltd. (in liquidation).—F. J. Parsons, 2, Austin Friars, E.C.2, was appointed receiver on January 31st, 1930, under powers contained in instrument dated November 19th, 1927.

T. Hall & Co., Ltd.—Mortgage for £600 and second mortgage for £620, both dated November 13th, 1929, charged on property in Cheam (being property acquired by the company on February 17th, 1930). Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagees: W. R. B. St. J. Gates, "Arolla," Warren Road, Guildford; and E. E. Taylor, "Central House," Finsbury Square, E.C.2.

Electrocord, Ltd.—Mortgage dated February 15th, 1930, to secure £2,664 and further advances, charged on hereditaments and premises in Holbeck, Leeds. Holders: Halifax Building Society.

Shoreham & District Electric Lighting & Power Co., Ltd.—Satisfaction to the extent of £700 on February 25th, 1930, of second debentures, authorised June 23rd and registered June 30th, 1927, securing £5,000.

City Notes.

Shropshire, Worcestershire & Staffordshire Electric Power Co.

In their report for the year ended December 31st last, the directors state that to provide capital for further development 200,000 6 per cent. cumulative preference shares have been issued; a premium of £3,750 resulting therefrom has been carried to the reserve appropriation account. A mortgage of £300,000 has been executed in favour of the company's bankers on account of overdraft facilities which have been arranged. The net receipts rose from £303,950 in 1928 to £369,109 last year and the balance, after meeting administrative expenses, debenture interest, &c., was £180,520 (against £142,993). It is proposed to pay a final dividend of 4 per cent. (making 8 per cent.) on the "A" ordinary shares, and 7½ per cent. on the "B" ordinary shares. A balance of £57,895 is transferred to the reserve appropriation account, making £144,296. This sum is to be allocated as follows:—Amount written off development expenditure, £4,047; transferred to reserve, £60,000; carried forward, £80,249. The accounts include dividends received from subsidiaries, in some cases for both 1928 and 1929. The capital expenditure during the year was £816,757, this amount including the acquisition of the Hereford Corporation undertaking. The undertakings supplying Presteign, Hook Norton, and Bromyard were also acquired during the year, and agreements have been made for the purchase of the undertakings at Builth Wells, Talgarth, Hay, Knighton, and Blockley. About 120 miles of overhead lines and underground cables were brought into service during the year, bringing up the total to 640 miles (excluding the Hereford undertaking). The sale of energy increased by 17 per cent. and the number of consumers by 45 per cent. The report contains a list of places in which a supply has been commenced, and states that the company has been granted a Special Order in respect of Bromyard and Ledbury. Another Order giving the company powers to supply electricity in Radnorshire and Brecknockshire is before the Electricity Commissioners. A Bill is being promoted in the current session of Parliament to increase the company's capital and borrowing powers, to extend its area of supply, &c. In May last the shareholders accepted an offer made by the Greater London & Counties Trust, Ltd., to purchase the whole of the "A" and "B" ordinary shares of the company. Mr. F. Massingberd Rogers, Mr. J. Herbert Edwards, and Mr. J. T. H. Legge (chief engineer and manager), have been appointed directors, while Mr. Legge has also been appointed managing director upon the resignation of Mr. W. G. Bond. Mr. J. A. Lycett is retiring from the board. Meeting: March 25th.

London Electric Supply Corporation, Ltd.

The annual meeting was held on March 5th, the Earl of Bessborough (chairman) presiding. In presenting the report and accounts (*vide* Electrical Review, March 7th, p. 456), the chairman said that in spite of reductions made in the electricity charges from January 1st, 1929, the revenue from the sale of electricity increased by approximately 5½ per cent., the energy sold amounting to 248,144,007 kWh, an increase of approximately 22 per cent. The reductions in charges had resulted in the average price obtained per kWh falling from 0.816d to 0.705d. The load connected during the year was 11,300 h.p., making a total connected load of 75,000 h.p. An "all-in" domestic tariff which was introduced at the commencing of the year under review had resulted in domestic consumers making a more extended use of electricity. The length of mains laid during 1929 was approximately 28 miles, at a cost of £40,126. Referring to the co-partnership scheme, the chairman said that the scheme would apply to all permanent employés of the company after they had completed one year of service. The amount to be credited to the co-partners' fund in each year was dependent on the rate of the additional dividend earned on the ordinary shares under the sliding scale, and the amount to be credited to the co-partners for 1929 was £4,145. The report and accounts were adopted.

Charing Cross Electricity Supply Co., Ltd.

Presiding at the annual meeting on March 5th, Mr. W. F. Fladgate (chairman), in presenting the report and accounts (Electrical Review, February 28th, p. 406), said that once more the accounts showed that the expansion of the company's business, as judged by new connections and the increased sale of electricity, continued at a satisfactory rate. In the West End the energy sold had increased by over four million kWh, and in the City by over six millions. During the last ten years the kW connected in the West End had increased by some 53 per cent., and in the City by some 56 per cent., while the corresponding increase in electricity sold was 124 per cent. in the West End and 111 per cent. in the City. The capital expenditure in the West End during the year was £100,000, the greater part of which was expended on renewals of machinery at Shorts Gardens station and on the acquisition and equipment of the new sub-station in Trafalgar Square. In the City the capital expenditure was £50,000, and the bulk of this was spent on the acquisition of a new sub-station to serve the City area. The report and accounts were adopted.

Metropolitan Electric Supply Co., Ltd.

The accounts of this company were abstracted in our issue of February 28th, p. 407, and the annual meeting was held on March 5th. Mr. George Balfour (chairman), who presided, said that the progress made amply justified the policy adopted of keeping plant and mains up-to-date, and in particular the policy of rapid extension and absorption in the Western area, where the sales of electricity had risen from 27,600,000 kWh in 1924 to 117,300,000 kWh in 1929. They had made and were about to make reductions in prices, but the question would be more comprehensively dealt with but for the uncertainty and magnitude of increasing rates. A considerable reduction in the charges for electricity was made in 1928, and the result last year was that consumers benefited to the extent of £71,000. Further reductions would be made to take effect from the end of the current quarter. The total output for 1929 was 167,000,000 kWh, as compared with 126,000,000 kWh in the previous year, and additional connections totalling 21,071 kW were connected to the mains, making a total of 172,640 kW, the maximum load being 64,370 kW. New consumers connected by the company and its subsidiaries numbered 5,869, making a total of 55,877.

Electrical Distribution of Yorkshire, Ltd.

The annual meeting of this company was held on March 4th at Leeds. Mr. R. W. Wickham (chairman), who presided, said the report showed a profit for 1929 of £96,481, which enabled the company to pay nearly £20,000 more in dividends than in the previous year. This coming year they would feel the full burden of the dividend on the new capital, and to maintain the dividend would require another £24,000. The number of consumers showed an increase of 7,073. In 1921 the electrical energy sold for all purposes, excluding traction, was 1,379,000 kWh. For the past year the total was 16,608,000 kWh. For the same years the average price per kWh sold was 4.6d. and 3.1d., respectively. In March last an issue of 600,000 shares was made, the largest in the history of the company. Authority had been received to supply electricity under new Orders which increased the company's area of supply to 1,197 sq. miles, with a population of 744,000. The report and accounts were adopted.

Cable Telephone and General Trust, Ltd.

The annual meeting was held on March 4th, Sir Alexander Roger (chairman) presiding. In presenting the report and accounts, the chairman said that the past year showed a steady and satisfactory improvement. The investment list had been materially increased, the geographical distribution being 45.55 per cent. in South America, 34.77 per cent. in the British Empire, 15.65 per cent. in Europe and Asia, and 4.03 per cent. in the U.S.A. In association with the Automatic Telephone Manufacturing Co. and the International Automatic Telephone Co. and other important British interests, they had arrangements and agreements with the Associated Telephone and Telegraph Co. of the U.S.A. whereby investments were made in telephone operating companies, long-term credits were arranged and manufacturing sales were facilitated, all for the purpose of creating "tied house" investment, financial and manufacturing business to be divided among appropriate associated companies. The report and accounts were adopted.

Chiswick Electricity Supply Corporation, Ltd.

Presiding at the annual meeting on March 4th, Mr. H. Kahn (chairman) said that the undertaking had made further progress during the year, the number of consumers increasing by 364, and the total revenue by £7,197. Generation and purchase of electricity, taxes, &c., were higher by £7,500, of which £4,278 was due to the higher rates and taxes paid in Chiswick and Aberystwyth. There was considerable agitation being carried out in Chiswick with regard to the prices charged by the Corporation for electricity, but taking into consideration the size of the undertaking and its limited tenure as compared with that of some of the big London undertakings, this criticism was unwarranted. It should be remembered that the rates paid by the Corporation to the Chiswick Urban District Council totalled £7,730, or 0.57d. per kWh sold. The report and accounts were adopted.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The report for the year ended December 31st last, which was presented at yesterday's annual meeting, records a net profit of £36,650, as compared with £33,659, to which is added £10,663 brought forward, making £47,313. Provision is made for the preference dividends and the "standard" ordinary dividends; £10,317 is transferred to special reserve fund—ordinary shareholders' benefit under the "sliding scale"; £3,998 is appropriated to co-partners, and £2,123 is carried forward. The connected load rose from 32,412 kW to 36,501 kW, and the sales of energy from 16,404,067 to 21,759,856 kWh.

Ericsson Telephones, Ltd.

The net profit for the past year amounted to £64,087, as compared with £31,011 for 1928. After providing for depreciation, debenture interest, &c., the directors recommend a dividend of 8 per cent., tax-free (against 5 per cent., less tax) on the ordinary shares. The general reserve receives £20,000 (against £5,000), and the special reserve £5,000, while £19,322 is carried forward. Mention is made in the report of the development of an efficient automatic totalisator equipment for which substantial orders have been received from the Racecourse Betting Control Board. Meeting: March 19th.

Liverpool Overhead Railway Co.

The gross receipts for the year ended December 31st last were £95,339, and working expenses, including appropriation to reserve, totalled £78,760. After deducting debenture interest and adding £3,730 brought forward, £13,554 is available. It is proposed to pay a dividend at the rate of 5 per cent. per annum on the preference shares, leaving £5,623 carried forward. The number of passengers carried decreased from 7,511,559 to 7,485,685.

National Gas Engine Co., Ltd.

The report for 1929 shows a net profit of £76,620 (against £72,440 for 1928), to which is added £22,450 brought forward, making £99,070. The preference dividend is paid, 7½ per cent. (against 7 per cent.) is to be paid on the ordinary shares, £15,000 is placed to reserve, and £2,500 to the company's welfare fund, leaving £24,569 to be carried forward. The report records the death of the late chairman, Alderman H. N. Bickerton, and the appointment of Mr. H. C. Bickerton to the board.

American Telephone & Telegraph Co.

This company reports that 1929 was a record year, the net earning for dividends rising from $12.11 per share to $12.67. During the year about 900,000 telephones were added, raising the number of telephones inter-connected in and with the Bell System to over 20,000,000. The capital expenditure during the year was $633,000,000, and at the close of the year the value of the plant and other assets was put at $4,228,000,000. The number of employés at the end of the year was 454,000 and 90,000 of these were stockholders.

Marconi International Marine Communication Co., Ltd.

The report for the year ended December 31st last records a profit of £203,111, as compared with £193,420 for 1928; to this is added £36,689 brought forward, making £239,800. The final ordinary dividend is 10 per cent., again making 15 per cent. for the year; £41,986 is transferred to reserve, and £17,405 is carried forward. The directors state that the position at home was maintained, and the company's foreign interests continued to show material progress. £50,000 has been transferred from the general reserve in respect of a settlement of excess profits duty, &c., with the Inland Revenue authorities. The allocation mentioned above will restore the reserve fund to the figure of £200,000. The report records the death of Lord Herschell and the appointment to the board of Major B. Binyon and Mr. J. O'Beirn. Meeting: April 2nd.

Bell Telephone Co. of Canada.

During the past year the company's authorised capital was raised from $75,000,000 to $150,000,000; $15,000,000 of "Series B" bonds were sold, and 140,000 shares of capital stock were offered to existing shareholders at $125 per share, over 99 per cent. being subscribed. The exchange revenue rose from $26,920,593 to $28,945,314, and the long-distance revenue from $8,968,387 to $10,343,894. After providing for dividends, a balance of $668,126 was carried to surplus. Additions costing $30,529,000 were made to the company's plant during the year.

Torquay Tramways Co., Ltd.

The profit for 1929 was £80,380, which included £50,500 net profit on the sale of 50 per cent. of the company's holding of ordinary shares in the Devon General Omnibus and Touring Co. After meeting debenture charges, there is a balance of £73,780, plus £1,786 brought forward. £10,748 is put to reserve and renewals and £4,000 to income tax, and after paying 9 per cent., free of tax, for the year, £2,027 is carried forward.

City of London Electric Lighting Co., Ltd.

The directors have declared a final ordinary dividend of 1s. per share, making 10 per cent. for the year, being the full standard dividend. After making the required contributions for the year to the statutory sinking funds the company is entitled to retain under the sliding scale a further sum of £58,630, which has been placed to the special reserve account, and a balance of £5,983 remains to be carried forward.

Automatic Telephone Manufacturing Co., Ltd.

The profit for the past year, after providing for depreciation, was £968 lower at £122,702. A final dividend of 6½ per cent. and a bonus of 2½ per cent. are to be paid, making the distribution for 1929 12½ per cent., as in the preceding year. The allocation to reserve is reduced from £35,000 to £19,500 and £118,285 is carried forward, against £93,483 brought in.

International Automatic Telephone Co., Ltd.

Out of the profit of £135,849 for 1929 (against £130,823), the company is again paying a final ordinary dividend of 6½ per cent. (making 10 per cent. for the year) plus a bonus of 2½ per cent. The deferred shares also receive a dividend of 10 per cent. and a bonus of 2½ per cent. The allocation to reserve is again £10,000 and the balance carried forward is increased from £69,735 to £82,578.

Launceston and District Electric Supply Co., Ltd.

The report for the year ended December 31st last shows a net profit of £1,596, to which is added £1,653 brought forward, making £3,248. It is recommended that £600 be put to reserve, £1,000 to depreciation, and that a dividend of 8 per cent. for the year (free of tax) be paid on the ordinary shares, leaving £1,136 carried forward.

Isle of Thanet Electric Supply Co., Ltd.

The total revenue for 1929 amounted to £179,036, and after deducting expenses, debenture interest, transferring £30,000 to general reserve and depreciation account, &c., there remains £25,074, to which is added £6,204 brought forward, making £31,278 available. A dividend of 4 per cent. on the ordinary shares is proposed, leaving £8,358 to be carried forward.

West Gloucestershire Power Co., Ltd.

The revenue for the past year rose from £60,231 to £80,308; a balance of £11,350 on revenue account is placed against the deficit incurred in previous years. The sales of energy increased from 10,947,341 to 13,263,745 kWh. The establishment of l.p. distribution systems at Bream and Westbury-on-Severn brings up the total of such systems to 29.

American and Foreign Power Co.

Last week a New York banking group made an isssue of $50,000,000 of this company's 100-year 5 per cent. debentures at the price of 90 per cent. A part of the issue was to be reserved for European investors. It is stated that the issue will constitute the only funded debt of the company.

Tynemouth and District Electric Traction Co., Ltd.

The directors have announced their decision to postpone payment of the half-yearly dividend on the 5 per cent. cumulative preference shares, due on March 15th next, as the financial result of working for the year ended December 31st last does not justify payment.

The Baird Companies.

It is announced that the Baird International Television and Baird Television Development Companies have decided to amalgamate their undertakings.

Waygood-Otis, Ltd.

The final dividend on the ordinary shares is 7½ per cent., making 10 per cent. for the year, as for 1928. The allocation to contingencies reserve is £25,000 (against £30,000), and £6,000 is again placed to pensions reserve; £17,631 is carried forward.

Clyde Valley Electrical Power Company.

The directors recommend a final dividend on the ordinary share capital of 5 per cent., making 8 per cent. for the past year. On the new ordinary share capital issued on April 24th, 1929, the dividend is at the rate of 8 per cent. from due dates of calls to December 31st, 1929.

W. Canning & Co., Ltd.

The report for the year ended December 31st last shows a profit of £61,706, as compared with £49,215 in 1928. To this is added £9,246 brought forward, making £70,952 available. It is proposed to pay a final dividend of 7½ per cent. (making 10 per cent. for the year, as for 1928), and to pay a bonus of 1s. per share, less tax. Of the balance, £20,000 is placed to reserve, £1,000 is placed to employés' benevolent trust fund, and £1,000 is contributed to the Birmingham Hospital Centre Fund, leaving £12,952 to be carried forward. The meeting was held on Tuesday last.

Newcastle & District Electric Lighting Co., Ltd.

The report for the year ended December 31st last shows a profit of £68,361, as compared with £72,809 in 1928. To this is added £15,564 brought forward, making £83,925, and after deducting debenture interest, transferring £5,259 to second mortgage debenture, &c., funds, and allowing £27,500 for depreciation, there is a balance of £38,183. A dividend of 7 per cent. is recommended on the ordinary shares (7½ per cent. in 1928), and a balance of £15,055 is carried forward. The charges for electricity were reduced as from January 1st, 1929.

Chelsea Electricity Supply Co., Ltd.

A final dividend at the rate of 11.2d. per share on the ordinary shares is recommended.

Postal Telegraph and Cable Corporation.

The directors have declared a quarterly dividend of 1¾ per cent. on the 7 per cent. non-cumulative preferred stock, payable on April 1st, 1930.

Telegraph Construction & Maintenance Co., Ltd.

The final dividend is 7½ per cent., free of tax, again making 10 per cent., tax-free, for the year.

Ward & Goldstone, Ltd.

The interim ordinary dividend is 3½ per cent. actual, as last year.

Swedish Company.

The report for 1929 of the *Allmänna Svenska Elektriska A.B.* states that a brisk demand prevailed for the company's products both in the home and foreign markets, and the value of the turnover was increased; prices, however, were not satisfactory. Competition in the high-pressure branch continued to be great, so that the company was compelled to continue the modernisation of its constructive and manufacturing works, and to erect new workshops. A site has been obtained for extensions at Vasteras, and the expansion of shops there and at Ludvika has taken place. At the end of the year the company employed in Sweden a staff of 7,668 persons. The report states that in order to strengthen the export business, the company established subsidiary companies in Rumania and Australia, created new agencies in Austria, Bulgaria and Czecho-Slovakia, and participated in the Groenpol Electricity Company, Amsterdam. The workshops at Yaroslaff, Russia, were completed and were being gradually brought into use. So far, it is said, the company's activities in Soviet Russia have proceeded satisfactorily, although some difficulties were unavoidable owing to special conditions. The company co-operated in the formation of the A.B. Electro-Invest, which is to acquire and carry on concession undertakings and finance electrical undertakings so as to bring orders to the A.S.E.A. A great sphere of work is stated to exist for such activity, and transactions both in regard to concessions and financing of undertakings have already been entered into in Poland, Jugo-Slavia and Germany, while various schemes are being prepared. The net profits are reported to have increased from 4.16 million kronen in 1928 to 4.95 millions last year, and the dividend is raised from 6 per cent. to 7 per cent.; the capital amounts to 85,000,000 kr.

Swiss Companies.

The accounts of the *Auminium Industrie A.G.*, of Neuhausen, show net profits of 11.7 million fr. for 1929, as compared with 11.2 millions in the previous year. The dividend remains at 15 per cent., while 1.2 million fr. has been transferred to the special reserve fund.

The *Schweiz. Gesellschaft für Elektrische Industrie*, Basle, which is chiefly a holding company, reports an increase in its net profits from 3.54 million fr. in 1928 to 3.80 millions last year. The dividend on the capital of 30,000,000 fr. is raised from 8 to 10 per cent. It is stated that various large schemes are being studied by the company.

French Company.

The *Compagnie Française des Procédés Thomson-Houston* has convened a meeting to consider the question of increasing its share capital from 330 to 550 million fr. The intimation to this effect has caused a heavy fall in the quotations for the existing shares. It has since been announced that the increase will not be made immediately, nor will the whole amount be issued at once.

Italian Company.

It is stated that the *Italian Pirelli Company*, Milan, which has a share capital of 191.5 million lire, proposes to increase its dividend from 11 per cent. in 1928 to 12 per cent. for last year. The Pirelli International Company is maintaining its rate at 25 per cent.

Stocks and Shares.

TUESDAY EVENING.

THE Bank Rate was reduced to 4 per cent. on the Thursday in last week, and the alteration came welcomely to Stock Exchange markets, which stood sorely in need of a little extrinsic encouragement to assist them at a time when business in stocks and shares threatened to fall away to something less than midsummer proportions. The decision of the Bank of England Court had an immediate effect upon stocks and shares of the gilt-edged type, most prominent amongst which were British Government securities, these leading a long run of rises that extended to Home Railway prior charge stocks, and to a number of industrial debentures. The quoted changes in the last-named may not be impressive, because, in point of fact, the change of front is noticeable more in the withdrawal of selling orders than in any particular influx of new investment demand. The effect is, however, to leave prices considerably stronger than they were before, with the result that, whereas two or three weeks ago it was none too easy to sell certain securities, however gilt-edged, the position has now given way to one in which the demand is outstripping supply. Central Electric fives are better at 1 discount. The fully-paid stock is on offer at 96¼. North-West Midlands Joint Electricity fives can be bought at 96½. There are no stamp and fee to be paid, at present, on either. A feature outside the gilt-edged market is that sharp rises have taken place in Hydro-Electrics, Brazilian Tractions, International Holdings, and various other speculative Americans. Speculation, as such, has received no particular impetus from the reduction in the Bank Rate, though, of course, the influences which govern investment will make themselves felt, sooner or later, in stocks and shares that rank below the first-class category.

Cables and Wireless.

A check has been administered to the falls that have been taking place in Cables & Wireless stocks. Although no fresh developments have occurred in regard to the Post Office position, it is felt that the fierce light of criticism that has poured upon the subject during the past month is likely to have some beneficial effect. The steadier tone of the market is shown by the fact that the two ordinary stocks, "A" and "B", show rises of 2 and 1 to 60¼ and 28½, respectively. The 5½ per cent. preference stock is now marked ex the half-yearly dividend of 2¾ per cent. gross, and the price at 93 shows a nominal fall of a point as compared with the previous week's quotation. The heaviness in Globe Telegraph and Trust ordinary continues to worry holders of the shares, the price of the latter having fallen another 10s. to 21, and this in spite of the fact that a good deal of money was exchanged, not long ago, from Cables & Wireless stocks into Globe Telegraph & Trust ordinary. The yield on the money at the present price is £4 15s. 3d. per cent. free of tax, equivalent to about 6¼ per cent. gross. The company's 6 per cent. preference at the present figure yield £5 7s. per cent., less tax.

Telegraphs and Telephones.

No particular changes have occurred in either telegraph or telephone issues. Marconi Marines lost 1/16, going back to 43s. 9d. The company has declared a dividend making 15 per cent. for the year, which is the same as that for 1928. The report should be out on Friday of this week, and the meeting will be held on April 2nd. The announcement is well up to expectation, because the reduction in the interim dividend had led to a little uneasiness on the point as to whether the full 15 per cent. could be maintained. The Ericsson Telephones report for 1929 is a cheering document, the net profit of £64,000 being more than twice as much as that in the previous year. The dividend is to be 8 per cent. tax free on the ordinary shares, which compares with 5 per cent. less tax a year ago.

American Telephone Progress.

The American Telephone & Telegraph Company has also issued its report during the past few days, and tells of remarkable progress made during 1929. The company is paying $9 a year by quarterly instalments, but it is not so much the distribution of profits from which shareholders have done well, as from the issue of shares on bonus terms. Moreover, the present report speaks of something like $700,000,000 being required for fresh capital expenditure, which suggests that the policy of issuing new capital at bonus figures has not yet come to an end. It is surprising to learn that the company has over 460,000 shareholders; that the lady shareholders outnumber the men; and that the average holding of proprietors is no more than 28 shares each. The price, at 250, is 5 points higher on the week. International Telephone and Telegraphs are better at 72½. Business was done the other day in Constantinople Telephone ordinary shares at 57s. 6d. The company's 6 per cent. obligation bonds are quoted at 85 middle. There has been a little inquiry for Cuban Telephone 5 per cent. convertible first mortgage bonds on the basis of 92.

Automatic Telephones.

The Automatic Telephone Manufacturing Company announces a profit for 1929 of £122,700. This is less than a thousand pounds lower than the profit for 1928. The final

dividend of 6¼ per cent. makes up the 10 per cent. usually paid, plus the regular 2½ per cent. bonus. International Automatic Telephone did rather better, its profit of £135,800 being £5,000 up. The dividend of 6¼ per cent. on the ordinary makes 10 per cent. for the year, with a 2½ per cent. bonus, the same as before. The deferred shares receive 12½ per cent. Automatic Telephones are unchanged at 37s. 6d., and International deferred shares are quoted at 34s.

Electricity Supply.

Electricity supply company shares show few changes other than those brought about by deduction of dividends from quotations, Metropolitan Electric ordinary, for instance, at 38s. 9d., being ex the dividend taken off the price last Thursday. Charing Cross ordinary at 25s. 6d., Westminster ordinary at 25s., and St. James's at 26s. are all ex. In the provincial group, Midland Counties at 27s. have gone xd. Clyde Valley shares weakened to 35s. The Three Counties company—Shropshire, Worcestershire, and Staffordshire Electric Power—reports a net profit of £180,500, against £143,000 in the previous year. The dividends on the "A" and "B" ordinary are the same as those of the preceding year. The price of the 6 per cent. preference is 22s. middle, and the 5½ per cent. first debenture stock is quoted at 102. The West Gloucestershire Power Company announces a balance for last year of £11.300, which is applied in reducing the debit balance of £29,290. The company's 6½ per cent. participating preference stock is quoted at 73 middle; the 5½ per cent. first mortgage sinking fund debenture changed hands this week at 94 and at a little under. Cleveland and Durham Electric 5 per cent. first debenture has gone back to 90½.

Manufacturing and Equipment.

British Insulated ordinary at 3 11/16 are 1/16 down, in spite of the 15 per cent. dividend being repeated. There is a shade of disappointment at nothing having been said in the report as to the possibility of another new issue being made. The substantial amount of £300,000 is written back to form the nucleus of a dividend equalisation fund. The appropriations to depreciation and reserve are very much smaller than usual, this being due to the fact that the company is, according to the chairman, well able to carry the weight. Telegraph Constructions have fallen 10s. to £25. G.E.C. ordinaries are unchanged at 2 5/16. Associated Electric ordinary came on offer from New York, and the price fell 1s. 6d. to 25s. Enfields are 1/16 down at 4¾, and Electric Constructions have failed, so far, to recover from the reduction to 11s. 3d., which took place last week. Business has been marked in Brush ordinary down to 124 during the past few business days, and Siemens have been dull, shares changing hands at 23s. at one time. India-Rubber, Gutta-Percha preference eased off to 12s.

Iron and steel shares keep tolerably steady; Vickers are 8s., after being a little higher. The rubber share market is rather on the heavy side, with business what the jobbers call very difficult.

Railways and Trams.

In the Home Railway market, the Underground stocks are firm, and, allowing for deduction of dividends on the last Stock Exchange pay-day, the variations are insignificant. Underground income bonds keep at 107. The shares are 22s. 6d. xd. Animation in the tramway stocks has once more come to something like a stop. British Electric Traction deferred is 25 points lower at 1,550. Madras Electric Tramways preference weakened to 10s. on the uncertainty still felt in connection with Indian industrials. The fall in Argentine exchange has depressed Anglo-Argentine Trams; the first preference shares have gone back to 3, and the 5 per cent. debenture is a point down at 70½.

Dollar Stocks.

Lively activity is in progress amongst a few of the popular dollar stocks, Hydro-Electrics and Brazilian Tractions being the two most favoured at the moment. Hydro-Electrics have been up to 46¾, though giving way a little from the best. International Holdings touched 7 before reverting to 6¼. Brazilian Tractions at 41 are 1½ better. Mexico Trams drooped to 20½, rallying to 21¼. Montreal Light and Power stock remains at 138¾, and Consolidated Gas, Electric Light and Power shares are steady at 115. It is proposed to increase the latter company's capital stock from 1,200,000 common shares to two million shares of this class, and to raise the 300,000 of preferred stock to half a million shares. Barcelona Traction has declared a dividend at the rate of 1 per cent. on the ordinary shares, and the price, after going back, hardened up to 25. The 7 per cent. non-cumulative participating preference stock stands at 145, and the dividend just declared makes 9 per cent. on this stock for the year. A meeting is to be held on Thursday next week for the increase and reorganisation of the company's capital. It is proposed to convert the existing shares into no par value shares. The meeting will be held at Toronto. Shawinigan Water shares at 77 are a point lower; Power Corporation shares are dull at 74¼. Pennsylvanias are steady at 87½. Radio Corporation shares spurted to 56¼ on rumours, most probably correct, that the Columbia Graphophone and the H.M.V. Gramophone Companies are likely to be amalgamated. The Radio Corporation is a very substantial holder in both these undertakings.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1927.	1928.	Price Mar. 11 1929.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	8	—	4 18 0
Brompton Ordinary	1	8½	8½	25/6	—	5 9 10
Charing Cross Ordinary	1	8½	8½	25/6xd	—	5 7 8
do. do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	8¾	8¾	35/-	—	5 12 0
City of London	1	10	10	39/-	—	4 7 6
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	35/-	—9d.	4 11 5
County of London	1	7	10	44/6	—	4 10 0
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's 7% Pref.	1	7	7	34/-	—	5 16 8
Elec. Supply Corporation	1	11	11	45/9	—	4 15 7
Kensington Ordinary	1	8	8	26/6	-	5 5 8
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	8½	9	27/-xd	—	5 3 8
Metropolitan	1	9	10	38/9xd	—	5 0 0
do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Midland Counties	1	6½	7	27/-xd	—	5 3 8
Mid. Elec. Power	1	15	8	32/6	—	4 18 6
Newcastle-on-Tyne Ordinary	1	6	6	28/9	—	5 1 1
do. 7% Pref.	1	7	7	35/6	—	5 9 10
Notting Hill 6% Pref.	10	6	6	1[2]	—	5 11 4
North Met. Elec. 6% Pref.	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	1	8	8	26/-xd	—	5 7 8
Scottish Power	1	8	8	29/-	—	5 6 8
South London	1	6½	8½	27/-	+6d.	5 3 8
Urban Ordinary	1	7	7	33/9	—	4 2 10
Westminster Ordinary	1	8½	8½	25/-xd	—	5 12 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	24/-	—	6 5 0
Yorkshire Elec.	1	8	8	32/-	—	5 0 0

Home Rails.

		Nom.	Approx. Dividend. 1927.	1928.	Price Mar. 11 1929.	Rise or fall	Yield p.c.
		£					
Central London Ord. Assented	Stock	4	4	78	—	5 9 7
Metropolitan		3½	4	69xd	—	6 7 0
do. District		4	5	72½xd	—	6 18 9
Underground Electric	£1	7	8	29/6xd	—	7 2 3
do. do. Income	Bonds	6	6	107	—	5 12 1

Telegraphs and Telephones.

		Nom.	Approx. Dividend. 1927.	1928.	Price Mar. 11 1929.	Rise or fall	Yield p.c.
		£					
Anglo-Am. Tel. Pref.	Stock	6	6	101½	—	5 18 3
do. Def.	"	1½	1½	24½	—	6 4 0
Automatic Telephone	1	10	12½	37/6	—	6 18 4
Cables & Wireless 5½ Pref.	Stock	—	5½	98xd	—1	5 18 3
do. A 7½ Ord.	"	—	—	60½	+2	... ...
do. B Ord.	"	—	—	29½	+1	... ...
Globe Tel. and T. Ord.	10	10	10	21	—½	*4 15 3
do. do. Pref.	10	6	6	11½	—	5 7 10
Great Northern Tel.	10	20	20	30½	—	6 11 2
Marconi-Marine	1	12½	15	2-[16]	—[16]	6 17 0
Oriental Telephone Ord	1	12	12	2[12]	—	*4 5 5

Home and Foreign Trams, &c.

		Nom.	Approx. Dividend. 1927.	1928.	Price Mar. 11 1929.	Rise or fall	Yield p.c.
		£					
Anglo-Arg. Trams First Pref.		5	5½	5½	8	—[16]	9 8 4
do. do. 2nd Pref.		5	6	6	8-[16]	—	9 16 0
do. do. 5% Deb.	Stock	5	5	70½	—1	7 1 10
British Electric Traction Def. Ord.	"	5	5	155)	—25	... ...
do. do. Pref. Ord.	"	8	8	124½	—	6 8 6
Brazil Traction	100	7	8	41	+2½	4 17 7
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	91½	+1	5 9 3
London & Sub. Trac. 5% Pref.	1	Nil	Nil	10/8	—	... ...
London United Tram Deb.	Stock	4	4	59½	—	7 12 4
Mexico Trams, 5% Bonds	—	5	5	66½	—	7 10 5
Mexican Light Common	100	Nil	Nil	70	—	... ...
do. 7% Pref.	100	7	7	75½	—	9 5 6
do. 1st Bonds	—	5	5	74½	—	6 14 3
Victoria Falls Ord.	1	15	15	2[12]	—	5 2 0
Yorkshire (West Riding)		Nil	Nil	6/-	—	... ...

Manufacturing Companies.

		Nom.	Approx. Dividend. 1927.	1928.	Price Mar. 11 1929.	Rise or fall	Yield p.c.
		£					
Assoc. Elec. Ord.		1	6	—	25/-	—1/8	4 16 0
Babcock & Wilcox		1	12	15	8	—	*5 0 0
British Aluminium Ord.		1	10	10	43/3	—	*4 12 6
British Elec. Transformer Pref.		1	7	7	10/-	—	... ...
British Insulated Ord.		1	15	15	3[16]	—[16]	4 1 7
Brush Ord.	Stock	10	10	196½	—	7 18 1
Callenders		1	15	15	9-[16]	—[16]	4 4 3
do. 6½% Pref.		1	6½	6½	23/9	—	5 9 5
Crompton Parkinson Ord.		5/-	—	80	12.6	—	6 13 4
do. 8% Pref.		1	8	8	25/-	—	6 8 0
Edison-Swan 1st Pref.		1	7½	7½	24/6	—	7 1 2
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction		1	7½	6½	1[16]	—	9 16 6
Enfield Cable Ord.		1	20	20	4[12]	—[16]	4 4 2
English Electric		1	Nil	Nil	3/9	—	... ...
do. do. Pref.		1	8	Nil	7/6	—	... ...
Gen. Elec. Pref.		1	6½	6½	24/-	—	5 8 4
do. Ord.		1	10	10	3-[16]	—	4 7
Henley		1	25	30	6	—	5 0 0
do. 4½% Pref.		5	4½	4½	4[12]xd	+1/9	5 6 0
India-Rubber		1	Nil	Nil	10/-	—	... ...
Johnson & Phillips		1	10	—	3[8]	—	6 10 8
Siemens Ord.		1	7½	7½	25/-	—	6 0 0
Telegraph Construction		12	10	10	25	—½	*4 16 2

*Dividends paid free of Income Tax.

Electrical Exports of the United States.

Figures for 1927 and 1928 Compared.

THE following figures, showing the exports of electrical machinery and apparatus from the United States and the principal countries of destination in 1928 are taken from the recently-issued annual statistics of American trade. The comparative figures for 1927 have been added and notes of any increases or decreases given. According to the official statistics the total values in thousands of dollars of the exports of electrical machinery and apparatus since 1922 have been as follows:—1922, 53,147; 1923, 59,927; 1924, 69,828; 1925, 73,790; 1926, 84,226; 1927, 84,610; 1928, 88,956.

Insulated wires and cables, although shown below, are not classed in the United States statistics as electrical goods.

	1927. Thous. $	1928. Thous. $	Inc. or dec. Thous. $
Generators, d.c., under 500 kW—			
Total	871	1,231	+ 360
To Canada	296	402	+ 106
,, Mexico	60	85	+ 25
,, Colombia	55	58	+ 3
,, Venezuela	31	29	− 2
,, China	11	40	+ 29
,, Japan	31	15	− 16
,, Australia	32	29	− 3
,, Cuba	55	38	− 17
,, Argentina	30	70	+ 40
,, Brazil	28	27	− 1
,, Russia	17	60	+ 43
,, S. Africa	15	10	− 5
Generators, d.c., 500 kW and over—			
Total	649	624	− 25
To Spain	6	125	+ 119
,, Canada	14	38	+ 24
,, Cuba	19	48	+ 29
,, Brazil	225	51	− 174
,, Chile	134	10	− 124
,, Japan	75	136	+ 61
,, Mexico	88	36	− 52
,, Argentina	26	41	+ 15
,, New Zealand	21	—	− 21
Generators, a.c., under 2,000 kVA—			
Total	170	227	+ 57
To Canada	32	82	+ 50
,, Mexico	17	18	+ 1
,, Colombia	33	—	− 33
,, Philippine Islands	5	17	+ 12
Generators, a.c., 2,000 kVA and over—			
Total	1,098	394	− 704
To Spain	—	127	+ 127
,, Mexico	46	22	− 24
,, Brazil	21	—	− 21
,, China	22	—	− 22
,, Japan	899	122	− 777
,, Dutch West Indies	—	76	+ 76
,, Canada	29	20	− 9
Steam turbine generator sets—			
Total	1,822	856	− 966
To Mexico	97	5	− 92
,, Cuba	105	45	− 60
,, Japan	45	63	+ 18
,, Brazil	28	11	− 17
,, Canada	106	178	+ 72
,, Chile	20	1	− 19
,, Java	13	—	− 13
,, Argentina	943	33	− 910
,, Australia	28	22	− 6
,, India	29	53	+ 24
,, British South Africa	7	170	+ 163
Self-contained lighting outfits—			
Total	1,340	1,116	− 224
To Spain	31	39	+ 8
,, Great Britain	122	155	+ 33
,, Mexico	56	51	− 5
,, Argentina	218	156	− 62
,, Colombia	41	31	− 10
,, Cuba	16	6	− 10
,, Uruguay	32	13	− 19
,, India	19	17	− 2
,, Australia	211	132	− 79
,, British South Africa	70	68	− 2
Distribution transformers less than 500 kVA—			
Total	829†	‡	†† −
Instrument transformers—			
Total	91	‡	†† −
Power transformers—			
Total	1,556	1,197*†	− 359
Other transformers—			
Total	1,051	893	− 158
Accessories and parts for generators—			
Total	1,137	1,094	− 43
Rectifiers, double current, and motor generators, dynamotors, synchronous and other convertors—			
Total	1,729	1,129	− 600
To France	12	19	+ 7
,, Great Britain	44	30	− 14
,, Canada	375	169	− 206
,, Mexico	35	42	+ 7
,, Chile	144	39	− 105
,, India	35	8	− 27
,, Japan	299	120	− 179
,, Australia	184	54	− 130
,, Spain	58	191	+ 133
,, Brazil	106	97	− 9
Switchboard panels, except telephone—			
Total	1,628	1,619	− 9
Switches and circuit breakers over 10 amp.—			
Total	1,987	1,758	− 229
Fuses and fuse blocks—			
Total	370	438	+ 68
Watt-hour and other measuring instruments—			
Total	419	994	+ 575
To Canada	46	105	+ 59
,, Mexico	25	65	+ 40
,, Cuba	38	43	+ 5
,, Brazil	133	217	+ 84
,, China	29	45	+ 16
,, Japan	27	90	+ 63
,, Australia	13	42	+ 29
Volt, watt, and ampere-meters, and other recording, &c., apparatus—			
Total	2,139	‡	−
Electrical indicating instruments—			
Total	‡	453	−
Electrical recording instruments—			
Total	‡	216	−
Other electrical testing apparatus—			
Total	‡	873	−
Lightning arrestors, choke coils, &c.—			
Total	726	782	+ 56
Motors under ½ h.p.—			
Total	‡	2,122§	−
Motors over ½ and under 1 h.p.—			
Total	‡	835§	−
Stationary motors, 1 to 200 h.p.—			
Total	3,068	2,872	− 196
To Spain	17	17	—
,, Great Britain	157	145	− 12
,, Canada	783	755	− 28
,, Mexico	246	217	− 29
,, Cuba	148	101	− 47
,, Brazil	98	66	− 32
,, Chile	175	101	− 74
,, China	42	33	− 9
,, Japan	83	116	+ 33
,, Australia	137	69	− 68
,, British South Africa	76	66	− 10
,, Argentina	281	377	+ 96
Motors over 200 h.p.—			
Total	402	387	− 15
To Canada	48	48	—
,, Mexico	29	51	+ 22
,, Chile	13	9	− 4
,, Japan	22	14	− 8
,, British South Africa	7	17	+ 10
,, France	10	7	− 3
,, Panama	32	—	− 32
,, Cuba	38	32	− 6
,, Colombia	49	—	− 49

	1927. Thous. $	1928. Thous. $	Inc. or dec. Thous. $
Railway motors—			
Total	915	598	− 317
To Canada	49	39	− 10
,, Spain	90	12	− 78
,, Mexico	1	15	+ 14
,, Brazil	181	94	− 87
,, Japan	264	331	+ 67
,, Australia	52	—	− 52
,, British South Africa	14	—	+ 14
,, Colombia	36	17	− 19
,, Portugal	61	84	+ 23
Starting and controlling equipment—			
Totals—			
For industrial motors	1,152	1,523	+ 371
For electric railway and vehicle motors	247	238	− 9
Accessories and parts for motors—			
Total	2,410	2,542	+ 132
Railway signals, switches, and attachments—			
Total	775	713	− 62
To Canada	330	432	+ 102
,, Japan	160	36	− 124
,, India	25	5	− 20
,, Chile	21	1	− 20
,, Australia	44	26	− 18
,, Spain	81	97	+ 16
Insulating material—			
Total	1,361	1,349	− 12
To France	51	56	+ 5
,, Great Britain	385	351	− 34
,, Canada	366	391	+ 25
,, Japan	115	166	+ 51
,, Australia	44	29	− 15
,, Italy	52	41	− 11
Fans—			
Total	1,005	938	− 67
To Canada	122	100	− 22
,, Argentina	252	160	− 92
,, China	72	140	+ 68
,, British India	68	24	− 44
,, Australia	66	32	− 34
,, Cuba	31	36	+ 5
,, Mexico	50	39	− 11
,, Great Britain	13	22	+ 9
,, Japan	36	33	− 3
,, Hong-Kong	43	83	+ 40
Other domestic heating and cooking apparatus—			
Total	‡	931**	—
Electric cooking ranges	‡	294**	—
Electric vacuum cleaners	‡	1,308††	—
Other motor-driven household devices—			
Total	2,312	858††	− 454
Industrial electric furnaces and ovens—			
Total	532	456	− 76
Metal filament lamps—			
Total	1,538	1,465	− 73
To Canada	28	23	− 5
,, Peru	24	26	+ 2
,, Mexico	301	294	− 7
,, Cuba	196	124	− 72
,, China	23	64	+ 41
,, Argentina	124	123	− 1
,, Brazil	50	28	− 22
,, Australia	115	116	+ 1
,, British South Africa	37	20	− 17
,, Chile	102	121	+ 19
,, Hong Kong	15	66	+ 51
Sparking plugs—			
Total	‡	1,417	—
Other ignition apparatus	‡	1,080	—
Insulated wire and cable, iron or steel—			
Total	191	217	+ 26
Insulated wire and cable, copper—			
Total	5,166	4,817	− 349
To Great Britain	463	353	− 110
,, Canada	573	841	+ 268
,, Mexico	506	472	− 34
,, Cuba	776	592	− 184
,, Brazil	566	265	− 301
,, Chile	278	133	− 145
,, Japan	50	58	+ 8
Batteries, flashlight—			
Total	2,250	2,941	+ 691
To Mexico	122	115	− 7
,, Argentina	324	351	+ 27
,, India	292	354	+ 62
,, Philippine Islands	217	173	− 44
,, Australia	91	110	+ 19
,, New Zealand	74	53	− 21
Batteries, other primary—			
Total	2,429	2,750	+ 321
To Norway	15	15	—
,, Great Britain	80	95	+ 15
,, Canada	152	81	− 71
,, Argentina	520	705	+ 185
,, Chile	43	53	+ 10
,, China	74	106	+ 32
,, Australia	702	736	+ 34
,, New Zealand	120	138	+ 18
,, British India	19	20	+ 1
,, Brazil	79	51	− 28
,, Mexico	125	36	− 89
,, Spain	25	125	+ 100
Batteries, storage—			
Total	3,670	3,401	− 269
To Denmark	30	33	+ 3
,, Great Britain	166	150	− 16
,, Canada	299	266	− 33
,, Mexico	120	109	− 11
,, Argentina	427	324	− 103
,, Brazil	141	149	+ 8
,, India	177	228	+ 51
,, Australia	444	334	− 110
,, New Zealand	220	110	− 110
,, South Africa	419	462	+ 43
,, Chile	142	72	− 70
Metal conduit, outlet and switch boxes—			
Total	1,038	1,331	+ 293
Telegraph apparatus—			
Total	1,037	866	− 171
To Great Britain	60	52	− 8
,, Cuba	20	25	+ 5
,, Canada	365	369	+ 4
,, Japan	99	24	− 75
,, Argentina	10	14	+ 4
,, Newfoundland	8	40	+ 32
,, Germany	62	81	+ 19
,, Mexico	226	34	− 192
Radio apparatus—			
Total	9,182	12,062	+ 2,880
To Canada	3,164	5,264	+ 2,100
,, Argentina	1,229	431	− 798
,, Brazil	366	1,401	+ 1,035
,, United Kingdom (receiving set accessories)	65	225	+ 160
Telephone instruments—			
Total	356	433	+ 77
Telephone switchboards—			
Total	727	400	− 327
Telephone equipment, other—			
Total	2,721	2,495	− 226
Locomotives, electric railway—			
Total	690	1,058	+ 368
To Chile	260	214	− 46
,, Japan	—	123	+ 123
,, Brazil	354	540	+ 186
,, Canada	21	100	+ 79
Locomotives, electric, mining and industrial—			
Total	631	471	− 160
To Chile	244	241	− 3
,, Japan	37	34	− 3
,, Mexico	70	13	− 57
,, Australia	6	5	− 1
,, British South Africa	30	19	− 11
,, Canada	74	47	− 27
,, New Zealand	—	32	+ 32

* 500 kVA and over.

** Mainly to Great Britain, Canada, Japan, Argentina, Australia, Mexico, Brazil, and New Zealand.

† Largely to Cuba, Mexico, Brazil, India, China, and Russia.

‡ Not specified.

†† Mainly to Holland, Great Britain, Canada, Australia, and New Zealand.

§Largely to Spain, Great Britain, New Zealand, Canada, Mexico, Argentina, Japan, and Australia.

Standard Guarantee for American Batteries.

The National Battery Manufacturers' Association of the United States has recently adopted a standard warranty in which the manufacturer guarantees to repair, or replace, at its option f.o.b. at the factory or any authorised service station, without charge to the user, except for transport, any battery of its manufacture which fails to give satisfactory service during a period of ninety days from the date of its sale to the user. The manufacturer further agrees, after expiration of the guarantee period, to replace with a new battery, on a *pro rata* basis, any battery which fails in normal motor car service, the latter being considered as not over 1,000 miles per month.

Electric Arc-furnace Regulation.

Some particulars of the automatic electrode control equipment of Ateliers H. Cuénod, S.A., of Geneva.

THE working of an electric arc furnace is generally characterised by continual variations in the state of the bath and its contents, which in turn cause fluctuations in the power consumed, the amplitude of which depends somewhat on the particular material under treatment.

In order to attain conditions which will ensure instantaneous adjustment of the electrode, it is necessary to search out and remove all tendencies towards sluggishness of action, and these

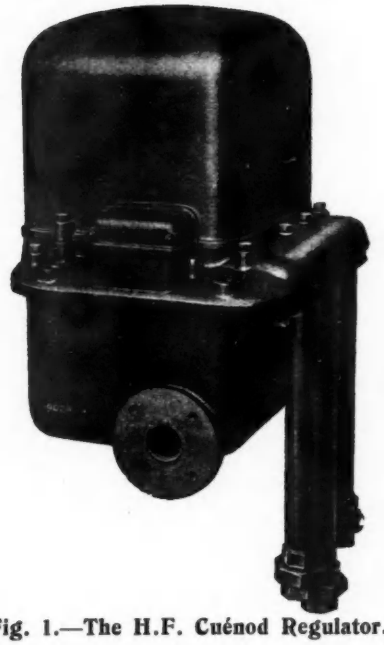


Fig. 1.—The H.F. Cuénod Regulator.

are found to be mainly due to the inertia of the moving masses, magnetic inertia of the controlling device, and "blacklash" or elasticity of the mechanism. It is out of the question to diminish the inertia of the moving mass by lessening the weight of the electrode and its gear, and therefore attention must be concentrated on the operating mechanism which moves the electrode. It follows that, for furnaces requiring very high speed regulation, the use of winches driven by electric motors is barred because the drums, gears, and rotors offer such great inertia to change of direction: in the same way, any system based on the excitation of direct current machines is useless on account of the hysteresis inertia of the machines. Further, all counterweight devices must be reduced to a minimum in order to keep the moving mass as light as possible. It is claimed that only one system has been found that entirely fulfils all the requisite conditions, namely, the hydraulic method. The automatic regulator itself must, of course, conform strictly to the conditions of rapid action. Its free movement should not be thwarted by having to operate water valves, especially when circumstances demand a water distribution system of large capacity, necessitating a considerable effort to work the valves. It is possible so to design the plant that all such heavy work can be thrown on to an auxiliary motor or governor, preferably operated by oil under pressure, as this ensures smoothness and reliability of working with the minimum of attention. The Cuénod automatic regulator type HF, of Ateliers H. Cuénod S.A., Geneva (London agent: Mr. C. Campart, 32, Theobald's Road, W.C.1) is claimed to embody all the points referred to.

The Cuénod regulator, figs. 1 and 3, comprises a solenoid 6 energised by the current taken by the furnace and operating the valve 14 of the pressure chamber 13 of the oil governor 5, which is supplied with oil under pressure from the pump 10. The main piston 12 of the governor rocks the lever 16, which operates the sleeve valve 2, acting as distributor of the high-pressure water from the pump 3 to the hydraulic ram 1, which is suitably geared to communicate its movement to the electrode. Attached to the apparatus is a safety device consisting of a solenoid 7, the winding of which is shunt connected between the sole plate of the bath and the electrode; this solenoid, working through a lever, moves the piston valve 18, which directs high-pressure oil to one side or the other of the piston 19, which is normally held down by the spring 20 and which, by means of a rocking lever 23 and a tappet rod, limits the travel of the main piston 12. The nuts 9 and 24 are for adjusting the movements of sleeve valve 2, the piston 19 and the oil governor 5.

When the current is normal, the main solenoid takes up its normal position, with the levers so placed that there is a definite leakage of oil from the pressure chambers 11 and 13, such that the main piston is in equilibrium and the sleeve valve 2 closes both ports, shutting water off from the hydraulic ram. If the current taken by the furnace becomes too great, the main solenoid becomes more strongly energised and starts to move, closing the port 14, which sets up an increase of pressure in chambers 13 and 11, so causing the main piston 12 to rise and the sleeve valve 2 to fall, opening the port, and admitting pressure water to the ram, so that the electrode is lifted. If the furnace current diminishes, the main solenoid is weakened and the levers, by means of the opposing spring, tend to open the leakage ports 14, so much that they discharge faster than the communicating port between 11 and 13, and the main piston 12 accordingly falls, raising the sleeve valve 2 and opening the discharge port from the ram, so that the electrode falls by its own weight.

The solenoid, which is wound for 50 cycles, 3½ A, at 40 volts, is of substantial design, the induction coil being wound on a laminated core forming the field for the short-circuited armature; it is "foolproof" and not liable to damage.

The HD type of regulator is similar to the HF model described above, except for the fact that it possesses a multiple-way valve 2 for controlling the water system. By this means, pressure water can be directed on either side of the ram piston or on either side of an auxiliary hydraulic motor.

Each type of regulator is furnished with emergency safety devices which lock the electrode in position in case of failure of either the electric current or the oil pressure. The hand control valve which is available, also has a locking device which comes into action when the water pressure fails. When, for any reason, the current strength diminishes, the electrode lowers itself into the bath, tending to increase the current. When the potential between the electrode and the soleplate of the bath drops to a definite low value the electro-

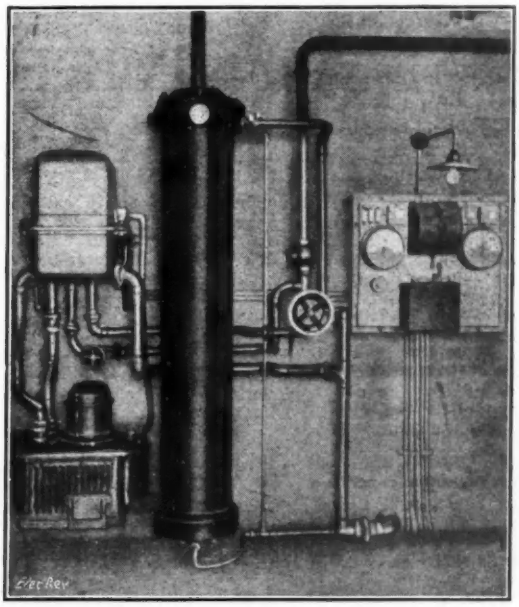


Fig. 2.—Typical Cuénod Control Installation.

magnetic locking device comes into action and prevents any further movement downwards of the electrode.

It is sometimes necessary to be able to modify furnace conditions during operation, without interruption to the automatic regulation. In the case of the current regulator, this can be effectively done by means of a sectionalised current transformer or of auxiliary resistances inserted in the main solenoid circuit; the latter arrangement provides considerable range of regulation.

Current transformers can be supplied suitable for connecting up to high- or low-pressure supply mains. When the arrange-

ment of the bus-bars permits, and between current limits of from 1,500 to 25,000 A, a bus-bar transformer (type B) is recommended, the primary winding of which consists of the bar itself. It is sometimes convenient to connect the current transformer on the high-pressure mains, in which case an open-type transformer is supplied for pressures below 6,000 volts; above that pressure an oil-immersed transformer is recommended.

The movements of the electrode are almost invariably made by means of a hydraulic ram, the diameter and stroke of which is designed specially to suit any particular installation. This

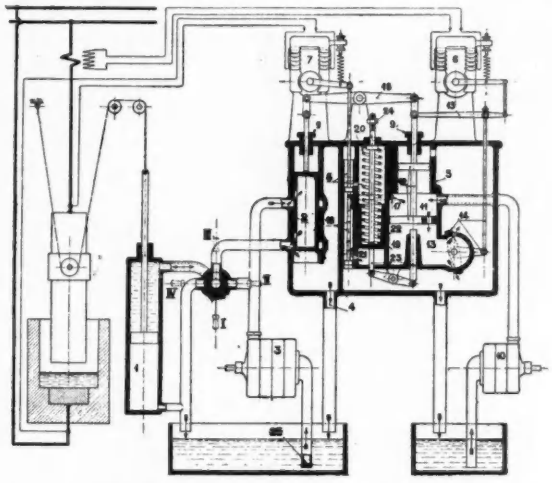
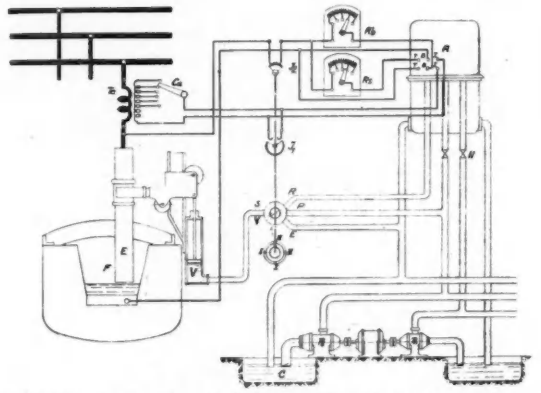


Fig 3.—Diagrammatic Section of H.F. Regulator.

apparatus is simple and robust in construction and operation, and it can be designed so that any worn parts can be replaced without difficulty.

Fig. 2 shows a complete equipment very compactly arranged. On the left is the HF regulator with the oil pump and tank below it. In the centre is the hydraulic ram, with its piston rod connected to the electrode by cable, and on the right of the ram are the multiple-way valve and the control board, above which is shown the high-pressure water supply pipe, and at the bottom is the discharge pipe from the ram.

The HF regulator can be utilised for any kind of regulation: current, voltage, power, impedance, or for any combination of them. Constant-current regulation is generally sufficient for most purposes and, on account of its simplicity, is most frequently used. Among other things, it benefits the power supply company, as the furnace plays the part of equaliser to the pressure variations in the supply network. Constant-power regulation is indicated if the network is subject to serious variations of pressure and the metallurgist is particularly anxious to secure a steady output from the furnace. The regu



F, furnace; E, electrode; V, hydraulic ram; Ta, current transformer; Ca, current rheostat; R, regulator; S, hand control valve with hydraulic lock; I, position locking the electrode; II, position raising the electrode; III, position for automatic regulation; IV, position lowering the electrode; Rb Rs, rheostats; C, check valve; Ph, oil pump; Pe, water pump; H, valve.

Fig. 4.—Connections for the Regulation of Impedance of 3-phase Furnace.

lation of impedance in three-phase furnaces is of great value in certain processes. It is to be noticed, however, that this method of regulation deals with fluctuations of power absorbed in the furnace proportional to the square of the pressure variations in the outside network. The systems of automatic regulation vary with the type of furnace and the kind of current used.

Fig. 4 is a diagram of connections for the automatic regulation of impedance of the arc of one electrode for a 3-phase furnace.

A Floodlighting Installation.

Some Particulars of the Equipment recently adopted by the London Fire Brigade.

An addition by the London Fire Brigade to its host of fire-fighting and -prevention apparatus is a new type of high-speed emergency tender. It is a powerful "Dennis" mobile vehicle equipped with a completely self-contained electric generating plant for operating three powerful electric floodlights in any district and at any time. Great value attaches to the unit, for often a fire at night is the cause of cutting off the light supply in localities where there is very little or no light at all. The chassis and bodywork are specially designed to cope with the particular requirements. The power-unit is robustly constructed, and is capable of working for long stretches without intermission; it is, in fact, of a type similar to that used for pumping. To ensure an adequate supply of cooling water, there is a special union at the base of the radiator through which a constant stream can be admitted from a hydrant. In outward appearance the vehicle resembles that of a box van, the entrance—approached by a single step—being at the rear, *via* a large door. The interior is spacious, and there is ample room for carrying several men, if necessary, in addition to an extensive quantity of gear of various kinds, but one of its principal uses is as a dressing-room for men who wear special breathing apparatus The tender is equipped with a 3½-kW, 110-V, d.c. protected - type fan-ventilated generator, having a shunt-wound field and shield - type ball bearings, 1,650 r.p.m. This is installed under the driving seat, the drive being through an auxiliary gear box with specially designed gearing from the main tender driving gear box. The cooling of the generator is contrived by a strong current of air drawn through the machine by a cast-iron centrifugal fan spigotted and bolted to the armature flange at the driving end. This arrangement gives a definite direction to the cooling air throughout the machine, eliminating risk of the occurrence of hot sparks in inaccessible positions. The frame of the machine is so arranged that the commutator is protected and secure against the risk of any foreign element entering and causing trouble.

Emergency Tender, showing Cable Reels and Projectors.

The switchboard, which is fixed on the inside wall of the tender by the driver's seat, consists of a black-enamelled slate panel mounted on flat steel battens; it carries a 6-in. diameter voltmeter and ammeter, in addition to switches, fuses, plugs, and so on. A special form of cable reel consists of a steel drum some 9 in. in diameter with protected teak ends supported on cast-iron end brackets, with special plummer blocks fitted with clamping screws for securing the drum in any fixed position before and after paying out the cable. At each end of the drum a collector ring on an ebonite base is fixed, on to which plunger contacts impinge for the purpose of feeding current from the generator. The plungers are fixed to iron brackets and suitably insulated. Three of these cable drums are fitted to each tender, and each is designed to accommodate 100 yards of 16 .021 twin-core c.t.s. cable connected to suitable terminals and fitted with a watertight pin-plug at one end and two pin sockets at the other. The arrangement permits of the cable, complete with its connections, being removed from any of the drums for joining up all or any lengths of cable to one drum, or for connecting up the floodlights to the generator if required. Ordinarily, however, the supply to each of the three floodlights fitted to each tender is by means of the open-type sockets on the switchboard. The floodlights are a unique feature of this mobile rescue unit. They are constructed of aluminium-alloy castings and gunmetal, and are designed to house single-piece-super Geco-ray "Silvered" glass reflectors for use with 500-W standard gasfilled lamps. The hinged front of each is fitted with a heavy domed heat-resisting glass which is protected by a strong metal guard. A special quick-focussing system is incorporated to enable the floodlights to be centred and focussed correctly—the beam angle being controlled by one large adjusting screw. These units are watertight, and are mounted on wrought-iron cradles carried on special tripods of low construction, with spiked feet for gripping the ground or pavement and rendering the unit fast. Their compact design enables them to be stowed away in specially designed compartments on the tender when they are not required for service.

The whole of the electrical gear has been specially designed and supplied by the General Electric Co., Ltd., and installed by Messrs. Dennis Bros., who have acted throughout in collaboration with the L.C.C. Fire Brigade.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

New Electric Furnace Temperature Controllers.

A new type of automatic temperature controller for electric furnaces, with which very satisfactory results are claimed to have been obtained, has recently been placed on the market by Mr. J. FINER, 147, Wilberforce Road, N.4. The controller is made in two types, the one suitable for furnaces working up to 500 deg. C. (932 deg. F.), and the other for furnaces up to 1,200 deg. C. (2,192 deg. F.). The operating principle of both types is the same, and is illustrated in fig. 3, which shows, diagrammatically, the controller for the lower temperature limits, with the adjusting device enclosed. Fig. 2 is an illustration of the controller for furnaces working up to 1,200 deg. C., with the adjusting arrangement external to the head. Referring to fig. 3, the stem, which is placed in the furnace to be controlled, is formed by an outer tube (10) of special alloy and an inner rod (11) of selected refractory material, joined together at the lower end. At the upper end of the stem is the adjusting nut 12, which is provided with a scale and pointer, so that the controller may be set to maintain any desired temperature within its working limits. A stop spring (13) engages in the milled edge of the adjusting nut and locks it. When the furnace is heating up, the stem of the controller expands downwards, and on reaching the predetermined temperature it causes the nut 12 to press on the projections 6, 7, so as to turn the levers 1, 2, around the knife edge bearings 4, 5. At the upper extremities of the levers 1, 2, two electrical contacts 8, 9, are arranged, and these are connected to a mercury switch tube relay. Separation of the levers 1, 2, breaks the circuit between contacts 8, 9, and also in the relay, which thereupon opens the furnace circuit, either directly or, where the load exceeds 30 amperes, through a contactor switch.

The interruption of the current causes the temperature of the furnace to fall and the stem of the controller to contract, so that the levers 1, 2, again make contact, leading to the main circuit closing and more heat being supplied to the furnace. The operation proceeds thus in cycles. The levers 1, 2, magnify the actual expansion or contraction of the stem in the ratio of 40 : 1 at the electrical contact points, so that a very high degree of sensitiveness is obtained. It is claimed that the controller will maintain a furnace constant at any predetermined temperature up to 1,200 deg. C. (2,192 deg. F.), with a variation of ± 1 deg. Fig. 1 shows a small electric furnace fitted with the controller (A), relay (B), and contactor (C). The controllers, which are of robust construction, are suitable for all electric annealing, tempering, and hardening furnaces, enamelling, drying, cooking and baking ovens, ceramic and other furnaces. We are informed that a number of "Efco" heat-treatment furnaces have been fitted with these automatic temperature controllers by Electric Furnace Co., Ltd., who have found the results obtained very satisfactory.

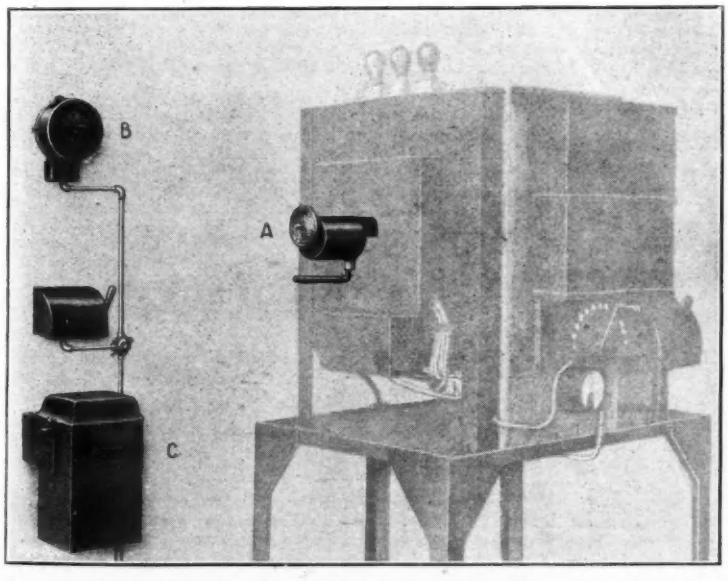


Fig. 1.—Small Furnace fitted with Controller, Relay and Contactor.

Fig. 2.—Controller for Working up to 1,200 deg. C.

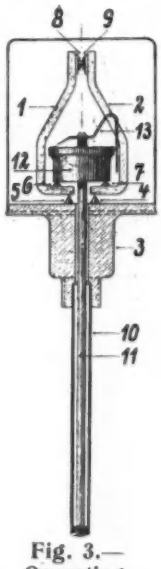


Fig. 3.—Operating Principle of Controller.

New Insulating Materials.

The following claims relate to introductions of Symentis Products, Ltd., Symentis Works, Salford. "Mastol" insulating varnish is produced by a new operation which eliminates a great deal of labour costs. The raw materials used in its manufacture possess insulating properties which ensure a lasting coat, resistant to the attack of oil, damp, fumes, &c. It is used extensively for covering cables, and is a good spraying varnish. For high-class insulation work, for impregnating, dipping and stoving, "Symentis" varnish, made under a similar process to "Mastol," is recommended. Both varnishes are made in three colours—natural, red and black.

A Large Photographic Lighting Unit.

The apparatus illustrated in fig. 4 is a complete lighting unit for use in connection with photographic work in the larger studios. It is a product of Messrs. Korting & Mathiesen Electrical, Ltd., 711 and 715, Fulham Road, S.W.6. The frame carries 15 reflectors, each equipped with a 500-watt gas-filled lamp. The reflectors are adjustable to allow for concentrating the light on a relatively small area or spreading it over a larger area, according to the object to be photographed, and are so designed as to illuminate in each case the area quite evenly. The model is mounted on a tripod base with rollers. The frame containing the lamps may be raised or lowered by means of a self-sustaining winch, or rotated about a vertical axis. The switchboard is assembled at the base of the tripod, and is detachable. It is mounted on a base with rollers, so as to be readily moved. There is facility for switching on and off each vertical row of five reflectors independently, while the five lamps of each circuit are protected by suitable fuses. The frame carrying the reflectors is suspended on trunnion arms, allowing for universal movement, and it may be removed from the telescopic stand and used on the floor. Furthermore, the frame, with reflectors, is quickly detachable from the trunnion arms and can be suspended overhead at any suitable angle by means of four eye bolts provided for the purpose.

Fig. 4.—"Kandem" 15-Lamp Photographic Lighting Unit.

A Train-lighting System

We recently witnessed a demonstration of the new "Ganz" train-lighting system of Pan-Electric, Ltd., 72-78, Fleet Street, E.C.4. The system employs a specially designed dynamo, with a cross-field winding by means of which the polarity of the dynamo is rendered independent of the direction of rotation. Referring to the diagram, fig. 5, the shunt magnet winding E may, to begin with, be imagined as energised by the battery B. As soon as the armature rotates, a voltage is developed across the brushes *q q* of the cross-field, and a current flows through the coils GG, whose direction is dependent on the direction of rotation. It may, for instance, be from left to right when the direction of rotation is clockwise, and from right to left when the direction is counter-clockwise. The field created by these coils is at right angles to the first field, and the working voltage appears at the brushes *nn*, which retain a constant polarity because reversal of the direction of rotation must always be accompanied by reversal of the cross-field. Both the rotor and stator have slotted windings, with the result that the machine is reduced to the smallest possible dimensions. Self regulation without a voltage regulator to a pressure which best corresponds with the battery requirements, and is also that required for the lamps, is effected by the interaction of two coils wound on the stator. One of these coils is connected in the lamp circuit and the other in the battery circuit. In normal running, that is when the lamps are running and the battery is simultaneously being charged, the current flowing in the coil in the lighting circuit, which is connected in the lighting circuit, flows in such direction that it strengthens the field produced by the exciting winding, while the current charging the battery, flowing through the coil in the battery circuit in the opposite direction, weakens the field in the same manner as the armature reaction. The machine lends itself to almost any convenient form of driving. The switchgear consists of two automatic switches built on to a common magnetic yoke. One of these connects the dynamo and accumulator in parallel when a certain minimum number of revolutions has been reached, and disconnects it when the speed falls to a minimum before the coach stops. It is provided with a shunt-coil fed by the dynamo, and a series coil through which the main dynamo current passes. The second switch serves to disconnect the battery when it is fully charged during daylight service, or when the voltage in the lamp-circuit has reached the upper prescribed limit. It is operated by two pressure coils, one connected across the dynamo terminals and the other across the lamp circuit. One of the special features of the equipment is that in the event of a break in the battery

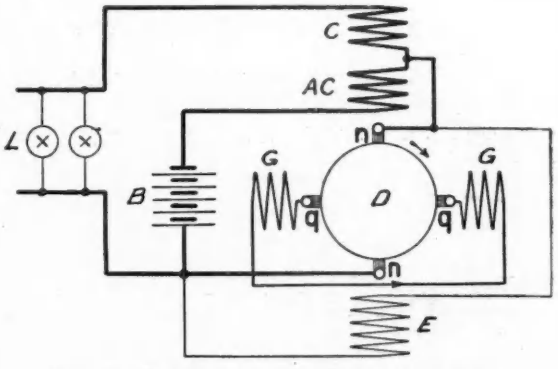


Fig. 5.—"Ganz" Train-lighting Dynamo.

current the coaches can be lighted direct from the dynamo while the train is in motion. Owing to its special design the weight of the dynamo is only about 330 lb. (1½ kW set).

New Sign Lamps.

The "Osram" pygmy sign lamp of the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2, is now obtainable in the standard colour-sprayed finishes of white, red, orange, yellow and green, as well as in the clear type. These lamps are claimed to be particularly suitable for outlining detail in signs with parallel burning lamps in place of series lamps. As its name indicates, the lamp is of small dimensions, the maximum overall length of the b.c. type being only 2¼ in.; the E.S. model is 2¾ in. long. The colours are claimed to be fast and durable. The lamps are rated at 15 watts, and are supplied for standard voltages of 100-130 V and 200-260 V.

A New Cable Junction Box.

The accompanying illustration, fig. 6, shows a new junction box for lead- and tough-rubber-sheathed cables which has been introduced by Central Electrical Engineers' Accessories Supply, Ltd., 193, Bethnal Green Road, E.2. It is claimed to lend itself particularly to easy handling. The four plugs are reversible for admitting the requisite number of cables. When one or more ways are used, the remainder unused are closed up by the plugs. The cables are held firmly

Fig. 6.—C.E.E.A.S. Junction Box.

in position and definitely earthed by the plugs and clamping-straps. Each strap is held down by two strong screws. The box can be supplied with a bakelite cover, so providing a junction box for lead-covered cable with efficient earthing provision and a cover which turns the whole into a bakelite box in appearance. The covers are provided with four cut spaces to correspond to the apertures in the box, obviating any need of cutting out or any labour apart from the actual fixing.

A Theatre Lighting Scheme.

Particulars of the Electrical Equipment at the New "Majestic" Theatre, Wellington, N.Z.

WHILE London and the provincial cities and towns in the Mother Country have been recently adding considerably to the ramifications of theatre-land, the Dominions have not been idle. The new "Majestic" Theatre in Willis Street, Wellington, is one of the latest additions to the theatre-world of New Zealand, and is in the circuit owned by Messrs. Fuller-Hayward, Ltd. Nearly 70,000 yards of "Henley" cables were used for the electrification, ranging from 1/.044 to 37/.083, and over 1,200 yards of flexible cables of the same make.

Fig. 1.—The Majestic Theatre, Wellington, N.Z.

The illustration of the exterior, fig. 1, shows the crowd awaiting admission on the opening night, and conveys an idea of the effect of the under-verandah lighting. This portion of the lighting scheme consists of nine 5-light fittings, each with five 75-watt "Argenta" lamps. The floodlighting was done with three Westinghouse type C.A.14 "Chromilite" floodlights, each fitted with a 500-watt lamp, and three Westinghouse type C.A.16 "Chromilite" floodlights, each fitted with a 1,000-watt lamp.

In the main entrance eight showcases are provided along each side, each being lit by two "Holophane" 983 reflectors equipped with 150-watt lamps. The main lighting is concealed above the showcases, and consists of 64 (32 on each side) "Holophane" 983 asbestos-covered reflectors fitted with 150-watt lamps. Colour screens are provided on the reflectors to allow of a wide choice of shades for a comprehensive colour scheme. Each of the four standards along each side is fitted with a 100-watt lamp.

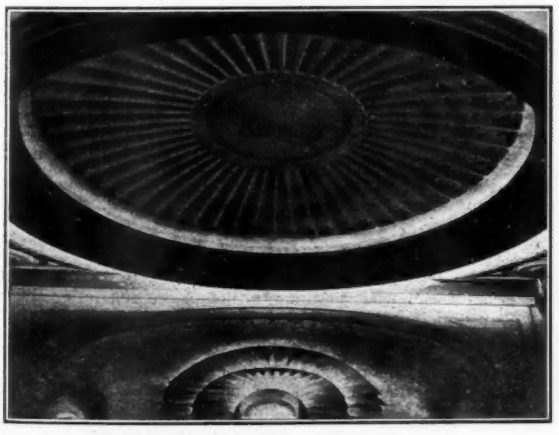


Fig. 2.—Main Dome, Illuminated.

The lighting of the entrance foyer, fig. 3, is concealed in a specially-built cove around the ceiling, consisting of 178 "Holophane" 981 asbestos-covered reflectors equipped with 100-watt lamps and colour screens. One of the features is the specially-designed plaque at the lift, which is lighted by spotlight.

The total seating capacity of the theatre is 2,300, with ample space between rows, and most comfortable seats. The lighting under the circle consists of thirteen 2-light enclosed fittings, fitted with 75-watt lamps, and there is a small dome in the centre lit with 133 natural-colour lamps in red, blue, green, and amber, controlled from the main dimmer.

Fig. 3.—The Entrance Foyer, Lighted.

The main dome, fig. 2, is 52 ft. in diameter, and has two specially-built coves; the inner has 180 "Holophane" 983 asbestos-covered reflectors, and the outer is provided with 184 "Holophane" asbestos-covered reflectors. The "sunburst" over the stage, fig. 4, is lit with 100-watt natural-colour lamps at the bottom, and three rows, totalling 126, "Holophane" 983 asbestos-covered reflectors. The proscenium arch is lit with 120 "Holophane" 963 asbestos-covered reflectors. Each 983 reflector is equipped with a 150-watt lamp, and each 963 reflector with a 100-watt lamp; all these are fitted with colour screens, and are controlled from the main dimmer. The combination of colours and dimmer control gives a most pleasing effect from the "sunburst." The curtain is a most beautiful one, which changes colour continually, by virtue of the footlights, which are operated from a special stage dimmer. The footlights are 40 ft. long, and are equipped with 60 "Holophane" 982 specially-cut and covered reflectors, fitted with 200-watt lamps. On the stage are also three rows of battens, each 50 ft. long, equipped with 225 "Holophane" 982 reflectors; 200-watt lamps and colour screens are provided. The balconettes (at either side) are lit with 12 "Holophane" 963 reflectors and 150-watt lamps with colour screens. The orchestra can be flooded in colour with from 10- to 1,000-watt flood-

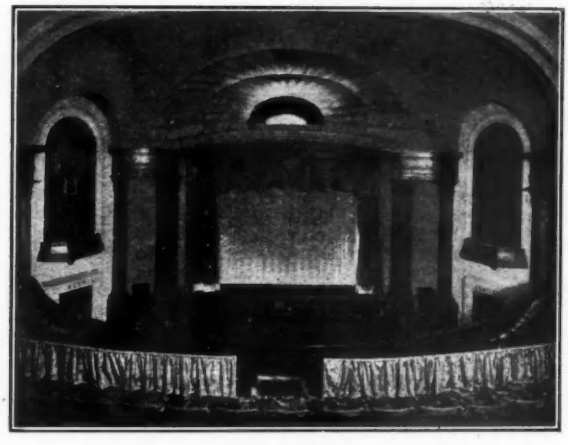


Fig. 4.—The Stage Proscenium.

lights mounted behind the proscenium arch. The illustration of the stairs up to the circle, fig. 5, shows the ceiling and newel fittings.

The cabaret tea lounge is provided with a glass floor for dancing, fig. 6, lit from below by 109 "Holophane" A.E.150 reflectors, fitted with colour screens and 150-watt lamps, amber lamps being used throughout. The whole of the auditorium lighting is controlled by a Ward-Leonard dimmer

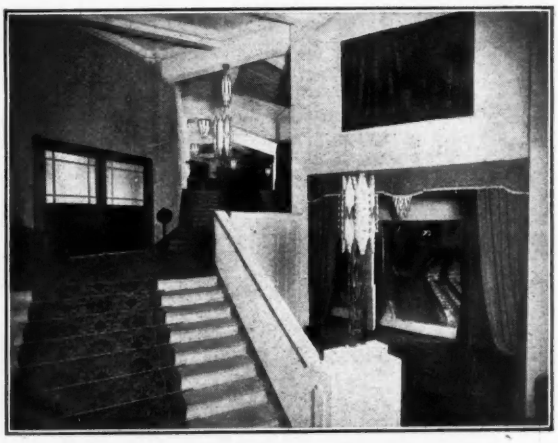


Fig. 5.—The Lighting of the Main Stairs.

in the operator's box for a total capacity of 110, 500 watts. A separate Ward-Leonard dimmer is installed on the stage for a capacity of 46,200 watts. Philips' lamps were used throughout, there being a total of 3,417, ranging from 15-watt pilot lamps to 1,000-watt main lamps, and covering a whole range of vacuum, gasfilled, "Argenta," sprayed, natural-colour, mill-type, drop-shape, spherical, and inside frosted lamps. The "Holophane" reflectors specially designed for the concealed lighting entrances number 1,368. A stand-by plant is provided, consisting of a 36/42 b.h.p. twin-cylinder, cold-starting, direct-injection crude-oil engine, directly connected to a 25-kW shunt-wound, 230-volt, 475-r.p.m. generator. This provides emergency lighting, and enables the performance to be carried on in the event of failure of the main supply.

Fig. 6.—Tea Lounge; Illuminated Glass Floor.

The architect was Mr. W. J. Prouse, the builders were Messrs. Hansford & Mills Construction Co., Ltd., and the lighting scheme was designed and the whole electrical installation carried out by Messrs. Turnbull & Jones, Ltd., who manufactured the bulk of the luminaires, which comprised 36 chandeliers, 4 newels, 8 standards, 32 brackets, 150 feet of stage battens, 40 feet of footlights, and 2 large imitation fires.

Communication and Power Engineering.

Some observations on the meeting point of the "light" and "heavy" branches of electrical engineering, and the problems which arise from their co-existence.

By Colonel Sir THOMAS F. PURVES, Pres.I.E.E.

(*Extracts from an address delivered before the* Sheffield Sub-Centre *of the* Institution of Electrical Engineers.)

On the one hand, practically every application of electricity to a special purpose owes some of its success to the work of all the other branches of the art. On the other hand, there are characteristics associated with some applications of electricity to the purposes of industry which can, or may, be harmful to work in other branches providing equally important public services.

Efforts to devise means of safeguarding the existing and essential art of electrical communication have been reflected in various Acts of Parliament, and much has been written of the so-called conflict between "weak-current" and "strong-current" interests in the past; efforts are now being made to solve the oustanding problems by the co-operation of all the parties concerned.

The "Comité Consultatif International des Communications Téléphoniques à grande distance" (the C.C.I.) was inaugurated for the purpose of solving technical problems of long-distance telephone transmission, and for the standardisation, so far as is possible, of line-transmission plant, apparatus, and methods of exploitation. The C.C.I. consisted at first of representatives of the various telephone administrations of Europe, but more recently its field of membership has been so extended as to make it practically world-wide. In arriving at its conclusions the C.C.I. has had the advantage of co-operation with representatives of the power side of the industry through certain international bodies, including the Union Internationale des Chemins de fer; Conference Internationale des Grands Reseaux Electriques a Haute Tension; Union Internationale des Producteurs et Distributeurs d'Energie Electrique; and the Union Internationale de Tramways et Chemins de fer d'interet local.

Corrosion.—The "Recommendations" issued by the C.C.I. relative to the protection of cables against corrosion due to electrolytic action follow Continental practice in that "isolation" is favoured in preference to "electrical drainage," or the connection of cable sheaths and pipes with the negative return, or bus-bar. At the moment there is a decided difference of opinion among engineers as to the best way of tackling the universal problem of protection against electrolysis set up by stray currents from tramway systems. In Switzerland, Germany, and other Continental countries, the connection of cable sheaths, or pipes, to the uninsulated rails, or negative bus-bar, of a tramway system is forbidden, while in America such connection is common practice. In Britain the position is somewhat peculiar; although the regulations of the Ministry of Transport appear to aim at an isolated system (except that the negative bus-bar, or the points of connection of negative feeders to the rails, have to be earthed) the practice of connecting the sheathings of their cables to the rails and/or to the negative bus-bar has grown amongst tramway authorities. The Advisory Committee on Railway Electrification appointed by the Ministry of Transport advised isolation for electric railways in this country.

So far as a telephone administration is concerned, the isolation system has much to commend it. At all events it is clear that the connection of cable sheathings to rails and negative returns should only be made after careful electrolytic surveys have determined the proper positions for the connections, and that when the connections have been installed there should be continuous control and supervision to ascertain whether plant extensions and developments may have made it essential to alter the positions of the "drainage" connections. The "isolation" system places the responsibility for maintaining satisfactory stray-current conditions upon the traction authority, whilst the "drainage" system shifts the responsibility to the shoulders of the cable or pipe owner,

who is burdened with additional and recurring expenditure for maintenance and the supervision of "drainage" connections.

Induction.—In connection with the inductive interference problem the C.C.I. has issued "Directives" (guiding principles) which indicate the best practice to be followed by the power industry and telephone administrations in order to minimise trouble, and an international body has been set up to carry out research into problems that jointly concern power and communication interests. This offshoot of the C.C.I. is called the "Commission Mixte International" (C.M.I.) and is composed of representatives of the C.C.I. and of the international bodies already referred to. The responsibility for investigation has been distributed between the various European telephone administrations and the power interests, and at the last meeting of the C.M.I. it was decided to extend the programme, to enlarge the membership to embrace gas and water industries, which are equally concerned with this problem, and to include a class of "Associate Members" in the organisation, as a very large proportion of the electrical industry is not represented by the international bodies now acting. The Institution of Electrical Engineers has itself joined as an associate member.

The outstanding problem at the moment is not "disturbance," but "dangerous" induced effects, which may endanger, not only telegraph and telephone plant and apparatus, but also the engineering and operating staff and the members of the public using the communication circuits, even when there is no direct contact between the two sets of plant. Such dangerous effects are produced inductively and, ignoring traction systems, they take place only on the occurrence of faults, or in some cases during switching operations, on the power systems. The telephone plant may be damaged by the breaking down of the insulation of apparatus or lines, and in severe cases by the outbreak of fire. *Personnel* may be jeopardised by shock; for example, a man may be caused to lose his hold when in a hazardous position on a pole, or, if very severe, death or permanent injury may be caused by the passage of the induced current through his body. Further, and much the more common, operators and telephone users may be adversely affected by "acoustic shock," which is caused when voltage sufficient to operate the lightning protectors (about 350 V) is induced in the two wires of the telephone circuit. The lightning protectors, one of which is in each leg of the circuit, will not act simultaneously; consequently the charge passes through the operator's set and the diaphragm of the telephone receiver is brought into violent contact with the pole pieces. The ear may be damaged and, even if it is not, frequent disturbance of this kind adversely affects the nerves of the person listening and, in the case of telephone operators, may cause such loss of morale that continued work is impossible. In Germany and America the amount of trouble caused in this way has been very serious.

"Acoustic shock" appears to be chiefly associated with the operations of three-phase systems employing an unearthed neutral point, as "arcing grounds" may be set up by the failure of an insulator and may persist without the circuit-breakers coming into action. The unearthed neutral system has, however, an advantage over the earthed neutral system in that it is not necessary with the former to arrange for such great separating distances in cases in which the power lines run parallel with communication circuits. This problem is of first-rate importance at the moment in connection with the installation of the grid by the Central Electricity Board, to be operated at 132 kV with the neutral point directly connected to earth at all feeding points.

Grid Lines Induction.—The Post Office has adopted the figure of 300 volts, given by the C.C.I. "Directives" as the maximum longitudinal voltage that can be allowed in a communication circuit on the occurrence of a fault to earth, but calculation to determine whether under any given condition that voltage will be exceeded is very difficult. Investigations in this country were carried out in co-operation with the Central Electricity Board and the British Electrical and Allied Industries Research Association, and as a result it has been agreed that when calculating the probable inductive effects on the occurrence of earth faults on the Board's 132,000-volt overhead lines, Pollazek's formula should be employed. The resistivity of the earth will, in general, be assumed to be 4,700 ohms, in accordance with a modification of the "Directives" adopted at the plenary meeting of the C.C.I. held in Berlin in June, 1929. It is stipulated, however, that when power lines are projected in neighbourhoods where the geological conditions point to higher resistance of the soil, tests will be made beforehand to ascertain whether a higher figure than 4,700 ohms should be taken.

Although fault currents to earth as great as 5,000 amperes have been suggested as possible, the Central Electricity Board is at the moment somewhat non-committal. To ensure safe conditions for such large currents the power lines and communication circuits would have to be separated by great distances if the routes ran parallel for any considerable distance. The grid system includes a high-conductivity steel-cored aluminium earth wire, connected to every tower and thereby to earth. It has been proved, both theoretically and by experiment, that a reduction of about 33 per cent. in the induced voltage is brought about by this arrangement. Making due allowance for this, however, the position is not free from anxiety, which only satisfactory working experience can remove.

Grid Crossings.—Relative to the satisfactory protection of Post Office lines that are crossed by transmission lines, it has been urged that the factors of safety used in the construction of the grid are so liberal that risk of a breakdown which would result in direct contact with Post Office circuits is so small that it can be ignored. The breakage of conductors from various causes which are not covered by factors of safety cannot, however, be ruled out of the range of possibilities, and in view of the consequences of an accidental contact, especially as regards risk to life of Post Office *personnel* and to users of the telephone system, it is felt that the attitude of the courts, and the public, would be such that the absence of any specified precautions would be condemned in the event of a serious accident.

In the case of subscribers' circuits there is no particular difficulty in following the normal procedure of putting the Post Office circuits underground at the crossing points, but in the past every effort has been made to avoid the degradation of the transmission efficiency of important aerial trunk lines which was produced by placing short intermediate lengths of them underground. We were also influenced by apprehension of the disturbance likely to be produced by *electrostatic* induction where an aerial telephone line is crossed by an overhead line carrying 132 kV. In view of the considerations mentioned it was reluctantly decided that there was no reasonable alternative to burying the Post Office lines at the crossing points, by the use of a number of 8-pair, 70-lb., star quad cables of specially low wire-to-wire capacity designed to alleviate somewhat the prejudicial effect of the underground section. The use of a number of small cables in place of a single large one should tend to limit the possible effect on the underground section should the overhead line suffer from the effects of lightning.

Piezo-electric Crystals.

The development of their application as a radio-frequency reference standard.

By H. J. LUCAS, A.M.I.E.E.

(*Summary of a paper read before the* Wireless Section *of the* Institution of Electrical Engineers.)

For the maintenance of a sub-standard wave-meter for calibrating wave-meters in bulk an accuracy of one per cent. sufficed for all needs prior to 1918. During subsequent years accuracies up to one part in 1,000 were called for and were obtained by the use of a wave-meter employing an oscillating triode, the accuracy of which was maintained by reference to a calibrated low-decrement closed oscillatory circuit. The latter has since become known as an "absorption wave-meter," and the reference was carried by means of the phenomenon known as the "Ziehen" effect. To-day a sub-standard has to be accurate to within one part in 10,000, and similar methods are utilised, but the reference standard is now a quartz resonator.

The first part of the paper deals with some observed errors in quartz piezo-electric resonators employed as frequency standards. It is shown that they are due to (*a*) frictional loading, and (*b*) losses arising from atmospheric humidity. The methods adopted to eliminate them are discussed, and the development of calibration apparatus employing the resonators as reference standards is dealt with.

The second part of the paper is, in the main, concerned with the use of the improved quartz crystal as a control element in a valve-maintained source of oscillations. The frequency-stability characteristic of such a system is investigated, the errors are found to be largely due to the valve system, and methods designed to eliminate these are discussed.

Finally, complete calibration equipment consisting of a multivibrator system with a range of 1 to 6,000 kilocycles per second in steps of 1 kilocycle per second, centrally controlled by a quartz crystal, is outlined.

While the equipment described more than meets the requirements originally laid down, *i.e.*, the calibration and maintenance of a sub-standard wave-meter to 1 part in 10^4, it is fully realised that this is not the time to call a halt. The behaviour of the quartz standard over relatively long periods of time and, in particular, its ageing will require years of observation with equipment of the highest precision. This will necessitate the development of improved methods of reference to the time standards; also the adequacy of the time standard as the final arbiter of frequency may at any time be questioned.

The experience gained of the behaviour of the valve and its tendency to develop frequency instability at medium frequencies calls for further investigation, which is actively proceeding. In this direction it is proposed to lower the frequency to 25 kilocycles per second, which represents the limit to which the natural quartz crystal can be obtained and worked. It is to be hoped that the production of large synthetic quartz crystals will not prove such a difficult proposition as the somewhat similar case of the artificial diamond. It is, however, felt that the true solution and urgent need is the development of the resonator reference-standard and its associated equipment to accuracies of the order 1 in 10^6, or, if possible, 1 in 10^7.

The author is indebted to the Air Ministry for permission to publish the paper.

Diesel-Electric Generators.

The Use of Richardsons-Westgarth High-powered Oil Engines in Electricity Generating Stations.

By W. S. BURN.

(*Extracts from a paper read before the* Diesel Engine Users' Association.)

THE facts that practically all the principal oil-engine manufacturers throughout the world have evolved, or are evolving, double-acting two-stroke engines of powers varying from 500 to 12,000 b.h.p. per engine for land and marine purposes, with cylinders from 3 to 10 in number, and that considerable running experience on land and sea has now been obtained to effectively demonstrate its practical success, are the author's excuse for dealing exclusively with the above-named type of engine.

He does not think he would even be accused of being unduly sanguine if he were to prophesy the succession of the double-acting two-stroke engine to the premier position in the industry within the next few years, at any rate for medium and large powers of from 1,000 b.h.p. upwards.

The application of the high-powered oil engine to land purposes are many and varied; nevertheless, British manufacturers are backward in this respect, and the Richardsons-Westgarth type oil engine is the first serious attempt in this country to produce a special high-speed oil engine for land purposes of up to 9,000 kW in a single unit.

The chief features of this engine are as follows:—Centre-port scavenging and exhaust are utilised, the special feature being the alternate scavenge nozzle ports arranged to give an almost axial air flow without shaping the piston top. The cylinder liner is held at the centre at the scavenge exhaust belt by the upper cylinder jacket, so that the ends are free to expand axially. It is therefore possible to make the scavenge-exhaust belt very substantial, as the outside diameter of the belt need not pass through the cylinder end, as in the normal type of two-stroke engine. The liner surface is unbroken by any gaps for expansion purposes, thus securing perfect piston-ring working conditions. The cylinder covers are of identical construction, all valves and fittings for them are interchangeable, and the simple design of the covers and the system of symmetrical water cooling are other advantages. Two identical fuel valves are arranged in both top and bottom cylinder covers, and the top and bottom combustion spaces are made of annulus form and almost identical. The fuel injection is on the controlled-fuel pump system, all fuel-pump and control-gear mechanism being centralised in one unit at the floor level, the fuel valves being of a simple automatic type. A horizontally-opposed twin-cylinder uniflow scavenge pump is used, which is almost perfectly balanced in itself, and is gear-driven at an increased speed from the engine crankshaft. Large-area mechanically-operated rotary valves with separate valves for suction and discharge are fitted to obtain large volumetric and pumping efficiencies.

A fundamental advantage of the oil engine is the fact that size has practically no effect on the fuel consumption, as in the case of steam plant, and it is therefore possible to employ relatively small sets economically; this feature's importance in congested areas in cities, such as London, is not fully appreciated. This advantage, when coupled with natural adaptability of geographical location due to the ease in handling fuel supplies, the relatively small amount of cooling water necessary, and the comparative ease in getting rid of the waste gases, cannot but give those engaged in the production of electricity food for thought.

Until recently the power of oil engines for land purposes available was comparatively small, generally not much in excess of 2,000 kW, and the first cost per kW high; the advent of the double-acting two-stroke engine has altered the position, as not only are much larger powers now available, but the first cost, weight, and space occupied per kW have also all been considerably reduced without in any way reducing reliability or longevity.

The R.W. range of powers available with the three sizes of cylinders is from 1,000 b.h.p. in the three-cylinder 15-in. diameter size to 12,500 b.h.p. in the ten-cylinder supercharged 26½-in. diameter size. In the case of the latter size, although the scantling is of the same substantial nature as that of the standard marine type, the weight per b.h.p. has reached the very low figure of 78 lb.; if special materials, such as cast steel and aluminium, were employed and the engine designed specifically for low weight, a very much lower figure could be obtained; possible 60 lb. per b.h.p. would not be extravagant.

A fundamental requirement of engines for peak-load purposes is low initial cost; as the periods of maximum output are of relatively short duration, it is a reasonable policy to consider higher mean pressures than would be deemed desirable for continuous running purposes. To obtain higher mean pressures efficiently a certain amount of supercharging is preferable and can be accomplished with the R.W. alternate scavenge port system by means of an automatic oscillating shutter device.

The fuel consumption per kW-hour is 0.52 lb., which is the equivalent of 0.37 lb. per b.h.p., and is made possible chiefly because of the very high mechanical efficiency of the double-acting two-stroke oil engine (87 per cent., including scavenge pump) with its small number of working parts.

Discussion.

Mr. Geoffrey Porter presided.

Mr. Challoner said that the most simple construction of Diesel engine, *viz.*, the two-stroke, double-acting, airless-injection type, was the one to be aimed at. At present there was a number of designs and constructions, but of very few of them had there been reasonably long experience in practice. The paper concentrated principally on the problem of fuel injection. Much energy had been devoted to the possibilities of designing engines to use a very wide range of fuels, but they were not now faced with the very poor grades of fuel which, some fifteen years ago, they were led to believe they would have to use; to-day they were getting better fuels and the oil suppliers were maintaining that the mineral fuels would be better still. If, however, high-powered oil engines were perfected, what were they going to do with them? He was not sure whether they would find the market that had been hoped for. People abroad had been perhaps a little more progressive and had built Diesel stations of some 25,000 or 26,000 h.p. per installation. Shortly one station would have the largest number of double-acting engines ever used, comprising 5,400-b.h.p. double-acting engines producing something like 14,000 to 20,000 kVA. How were such big engines going to be sold in this country? A station with 7,500-kW sets should possibly cost something like £15 or £16 per kilowatt and, if the powers-that-be would appreciate the value of the Diesel engine for meeting peak loads, it would be possible for the manufacturers to reduce that figure still further. The Diesel engine was very well adapted for such work, because it could be put into service in a remarkably short time. The electricity supply industry must support the oil engine if it was to be proved that the Diesel engine was a cheap form of stand-by and peak-load equipment.

Mr. H. A. D. Acland expressed surprise at the references in the paper to the difficulty of keeping the fuel jets clear of carbon, because he had seen solid-injection jets which, after being at work throughout sea voyages of 25,000 miles, had remained quite clean, although no precautions were taken to cool them.

Mr. Ferguson expressed the hope that the paper would be brought to the notice of the proper authorities, so that they might realise what one firm in this country at any rate was prepared to do; no doubt others would follow its example.

Mr. H. Wilson mentioned that it was rather early yet for him to give any information about supercharging, because at the power station at Ashford the supercharged set had been running for only a very short time. They would not find a market for those engines in this country until the Central Electricity Board had been persuaded to attach a little more importance to the Diesel engine.

Mr. C. O. Milton (Maidenhead) pointed out that those who had been concerned with the Association's annual reports on working costs were aware that a question had been asked each year about experience gained in the use of heavy-oil engines in parallel for driving alternators, and the replies received in almost all cases were to the effect that the results had been satisfactory. Where there was failure it was probably due to something in the alternators themselves, and not the engines. He believed there was no inherent difficulty in designing engines suitable for driving alternators in parallel. The prophecy that the two-stroke, double-acting, airless-injection engine would be the ultimate solution of the heavy oil-engine problem would prove to be correct.

Mr. H. W. Watts (Epsom) said that Mr. Burn's firm was probably one of the first of the manufacturers in this country to put forward an engine of 12,500 b.h.p. Manufacturers should not give up hope, for there must come a time when such engines would be installed in some of the power stations in this country to meet the peak loads. He believed a time would come when this problem would receive closer consideration than it had up to the present. His experience of paralleling alternators extended back to 1896, and recently he had run a Diesel engine in parallel with a large steam plant without

any trouble whatever. In nine cases out of ten troubles in paralleling were on the electrical side.

Mr. W. H. SKINNER could not see how supercharging was going to raise the power output of an engine very much.

Mr. W. O. BROWN said the industry seemed to be suffering from some kind of inferiority complex originating from the attitude of the Central Electricity Board, whose activities would not cheapen electricity. If one considered whether agricultural people and the owners of industrial plant in outlying places were going to benefit by tapping the lines of the Central Board, the cost of doing so would seem to indicate that the small user would not get cheaper electricity from the Government scheme. Therefore, Diesel-engine builders should transfer their activities to the actual users of power. A very successful scheme had been carried out at a factory within two miles of one of the generating stations which were being included in the Scottish linking-up scheme. The concern was paying (he was speaking from memory) 35s. per quarter per kilowatt of maximum demand, plus 0.56d. per kWh consumed; the cost amounted to about £1,000 per quarter, plus the cost of the kWh consumed. After two years or so the firm in question bought an oil engine, which it paid for within 18 months, and generated its own electricity, thus saving the quarterly charge. The electrical people said at first that they could not possibly reduce their charges, but about six weeks after the oil engine had started running they went to the works with their hats in their hands and said: "If you will only use some of our electricity you need only pay 0.56d. per kWh, and we will say nothing about the 35s."

Mr. BURN, replying briefly to some of the points raised in the discussion, said there seemed to be a very reasonable case for the large oil engine if the Electricity Commissioners would really study the problem. One of the objects of the paper was to ascertain the opinion of electrical experts. Naturally, difficulty was being experienced in selling those engines. It was not possible to get rid of engines of the ordinary type, and so they had to evolve a cheap type. The extraordinarily good turning moment was a feature of the double-acting engine.

Watt-hour Meter Accuracy.

The Influence of Frequency on Behaviour.

By A. E. MOORE, M.Sc.(Tech.), M.I.E.E., and W. T. SLATER, M.Sc.(Tech.).

(*Summary of a paper read before the* METER AND INSTRUMENT SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

IT has previously been shown that the disk speed of induction watt-hour meters becomes lower as the wave shape is distorted from the sinusoidal and also apparently as the frequency increases. The changes in accuracy with changes in frequency are least when the power factor of the load is unity, the reason being that the power-factor adjustment in the meter depends on the frequency of the supply. The meters are very inaccurate at 0.5 power factor at other than normal frequency, but they also show varying degrees of inaccuracy with changes in frequency, even at unity power factor, and it was in search of the explanation of the unity power-factor errors that the investigation was undertaken with Metropolitan-Vickers type "N" meters, which employ a thin disk, and it was thought that possibly their good characteristics were due in some measure to this. An induction meter may be considered to be a small induction motor with short-circuited rotor, and the conditions obtaining (even when the disk is rotating at full-load speed) are somewhat similar to the starting condition in the induction motor. If the time-constant of the rotor is high, the starting torque is small and the torque may be increased by increasing the resistance of the rotor.

Experiments appear to indicate that the thickness and conductivity of the disk play an important part in the behaviour of the meters under certain conditions. With thick disks of high conductivity the speed, and therefore the driving torque, rapidly diminish when the frequency is increased above a certain value, but the diminution in speed is less marked with thinner disks and is changed to an increase of speed in the cases of very thin aluminium and thick "Eureka" disks. It is not suggested that "Eureka" alloy would be suitable for disks; on the contrary, the driving torque when it is used is so very small that probably it would be useless, but it was desirable to make experiments with high-resistance disks in order to strengthen or disprove the assumptions made.

At first the diminution in speed below 50 periods per sec. was thought to be due to the ohmic resistance of the pressure coils, and in some meters it may be so to a certain extent. The effect of the ohmic resistance would be to limit the magnetising current as the frequency is diminished and hence, therefore, to limit the voltage flux. If such were the case, the permeability of the iron would also affect the result. From measurements of the resistance and impedance of the voltage coils, however, it was concluded that the effect (in this meter at any rate) must be relatively small and unimportant.

The next cause which suggested itself was the change in the brake torque due to changes in the strength of the voltage flux with changes in the frequency. If we consider the driving torque to be due to the eddy currents induced by, say, the voltage pole acting on the flux of the current pole, then the driving fluxes also act as brake fluxes, and the voltage-coil flux acts in this manner to a very considerable extent. The eddy currents are proportional to the frequency and the flux, but the voltage flux is inversely proportional to the frequency. Hence the eddy currents due to the voltage flux are independent of frequency. The current flux is substantially independent of frequency, and therefore the driving torque produced by the current flux and voltage flux eddy-currents is also independent of frequency. The brake torque produced by the voltage flux is, however, proportional to the square of the voltage flux. When the frequency is doubled the voltage flux is halved; so that, if the voltage flux is at all comparable in magnitude with the flux of the permanent brake magnet, there is a considerable diminution in total brake torque as the frequency is increased and, of course, a considerable increase in the brake torque as the frequency is diminished. Attention is drawn to the rapidity with which the curves of percentage variation of disk speed bend down as the frequency is diminished below 50. In order to verify this assumption, tests were made on two different makes of polyphase meter (two single-phase elements combined) and from the results it may be inferred that the changes in the reactance of the disk and the changes in the magnitude of the voltage flux, due to changes in frequency, act in opposite senses, the one slowing the meter down and the other speeding it up with increase in frequency.

Having separated the two effects and ascertained their relative magnitudes, determined the time-constants of the disks, explained the torques produced, and determined some of the other phase errors, the following conclusions are drawn.

From their behaviour at varying frequency induction meters may be expected to register slower on distorted than on sinusoidal wave-shapes. The results given in the paper previously referred to* show that all the induction meters tested register slower on distorted waves. In the discussion on the paper, Mr. L. Wild attributed the uniform slow running of the meters on distorted waves to the fact that all the waves used were not smooth waves, but had what he termed "architectural features." He himself had found that induction meters registered sometimes faster and sometimes slower on distorted, but smooth, waves than they did on sinusoidal waves. The variations in accuracy obtained by Wild were comparatively small, as were also those obtained by Rosa, Lloyd and Reid at Washington;† and the authors are inclined to attribute them to inconsistencies in the meters themselves, or to changes in the iron losses, or to both.

It would appear from the results and deductions that in order to reduce the frequency errors in the meters certain points must be kept in mind in the design. First, the ratio of the active voltage flux to the permanent brake-magnet flux should be kept as low as expediency will permit. Secondly, the time-constant of the eddy-current paths should be as low as possible, consistent with a reasonably high torque. Since a reduction in the active voltage flux would result in a reduced torque, it would appear that the point first mentioned should be effected by means of stronger brake magnets, which would result in lower speeds, a desirable feature in some types of meters.

The authors have not attacked the problem of the additional errors shown by induction meters when working at other than unity power factor at various frequencies. It would appear that the present method of power-factor correction leaves something to be desired. The meters are adjusted at one particular frequency, and it is possible that at higher frequencies the errors introduced by the correctors may be equal to, if not greater than, those which they are intended to eliminate.

The usual theory of induction watt-hour meters assumes that certain factors, such as the phase of the voltage flux and the time-constant of the eddy-current paths, are practically those that would hold in an ideal meter. The authors have shown that these assumptions are not justified, even in modern well-designed meters. In the case of thick copper and aluminium disks the time constant is about 0.0008, and at a frequency of 50 the current would lag by an angle of about 14 deg. At a frequency of 100 the angle would be about 27 deg., and these angles are comparatively large.

* I.E.E. *Journal*, 1911, Vol. 47, p. 3.

† *Bulletin, U.S.A. Bureau of Standards*, Vol. 1, p. 421.

New "Sunlight" Lamp.

The General Electric Company of America has been experimenting with an electric lamp which, it is claimed, has more health-giving properties than the sun's rays and can make the meanest cellar as healthy as a hillside in summer. Dr. Luckeish, the company's director of lighting research, says that the bulb contains tungsten and mercury elements, and he is convinced of its ultimate success. The interiors of future buildings, he says, will be covered with substances, such as translucent quartz, having the power to conserve ultra-violet radiation.

Parliamentary News.

[By our Special Parliamentary Reporter.]

The Severn Barrage.

On March 3rd, during the discussion of a supplementary estimate for the Ministry of Transport, Mr. Morrison, the Minister of Transport, said that the whole cost of the second stage of the investigation for the Severn Barrage scheme was estimated at £17,000, and provision was proposed to be made in the Ministry's estimates next year for that proportion of the charge which was expected to fall due in 1930-31. In 1924 the Government authorised certain inquiries, which continued up to a point. It was satisfied, by the report of a committee, that it was worth going further with the scheme, and it was in connection with engineering assistance, the preparation of models, &c., that the money now asked for was required. It did not mean that the Government had come to any conclusion whether it would be wise or not to erect the power station. It merely meant that the result of the first stage of the inquiry was sufficiently encouraging to warrant the Government's going a little further, and it hoped for a valuable report in due course. This stage, including the preparation of a scheme, would occupy about two years.

The estimate was agreed to.

Railway Electrification.

On March 5th Mr. Ede asked the Minister of Transport how many miles of railway track had been electrified on each of the four main railway systems of the country; and what percentage this represented in each case to the total mileage of the system.

Mr. Morrison said that at December 31st, 1928, the latest date for which complete information was available, the running track miles electrified on the systems of the amalgamated railway companies and their percentage of the total mileage of running track in each case, were as follows:—Southern Railway, 678 miles (equivalent to 16.3 per cent. of the total); London, Midland & Scottish Railway, 219 miles (1.6 per cent.); and London & North-Eastern Railway, 120 miles (1 per cent.). The only portion of the Great Western Railway Company's system which had been electrified consisted of a few short lengths of line in the neighbourhood of London in which that company had a joint interest.

The Dorking Special Order.

On March 5th Sir George Cockerill asked the Minister of Transport whether he had yet received the report of his Inspector upon the inquiry held on July 19th last upon the Special Order promoted by the Dorking Electricity Supply Co., Ltd., relating to supplies of electricity in the Dorking Urban, Dorking Rural, and Reigate Rural Districts; and when he would be in a position to give his decision.

Mr. Morrison said that the answer to the first part of the question was in the affirmative. He was not fully satisfied that the proposals of the Order as it stood were in the best interests of the development of electricity supply in Dorking and neighbouring areas, and he had asked the Electricity Commissioners to discuss the position with the promoters and other parties concerned with a view to making further proposals.

Electricity Supply in Norfolk.

On March 6th Mr. Christie asked the Minister of Transport if his attention had been called to the position of the Rural District Council of Depwade, Norfolk, with regard to its supply of electricity, whereby after two years the Council might receive a supply from the East Anglian Electricity Company at a high price which the East Anglian Company would not generate itself, but would purchase either from the Corporations of Yarmouth or Norwich, which were supplying customers in the immediate neighbourhood at a much lower rate; and whether, in those circumstances, he would arrange for Depwade to be included in the Norwich or Yarmouth zones.

Mr. Morrison said that the district in question fell within the area granted to the East Anglian Co. by its Act of 1927. As permitted by that Act, however, the Commissioners had decided to allot parts of the area to the Norwich and the Yarmouth Corporations. In settling the boundary they had had regard, after a local inquiry, to the proper development of the remainder of the company's statutory area and considered that part of the district of Depwade should on technical grounds form part of it.

Newport (Mon.) Corporation Bill.

On March 7th a Select Committee of the House of Commons found the preamble of this Bill proved. The measure seeks power to construct a new arterial road and to run railless trolley vehicles upon it.

The Derby Corporation Bill.

This Bill, which contains provisions for the running of railless trolley vehicles inside and outside the borough, was considered by a Select Committee of the House of Commons on March 6th. Opposition to the proposals, so far as they affected the extra-borough services, was forthcoming from the Derbyshire County Council. The Committee decided, however, to grant the powers asked for within the borough, and in respect of six of the twelve specified routes outside the borough.

Legal.

Breach of Electricity Regulations.

Samuel Crook, Tyldesley, electrician at St. George's Pit, Tyldesley, was at Leigh County Police Court recently fined £5 for a breach of the Electricity in Mines Regulations which led to a fatality. On January 28th some trouble was experienced over the haulage, and Crook was asked to locate it. The complaint was that he examined the controls, but did not make sure the circuit was made "dead" before he did so. In evidence, Crook said he was unscrewing some bolts under the impression that the switch was off. He would not have done so had he known the switch had not been taken out, for he was running a very great risk to his own life. There was a sudden flash, the lights went out, and a man named John Griffiths fell on him. He picked him up and applied artificial respiration, which, however, was of no avail.

Fraudulent Consumption of Electricity.

A number of people appeared at the Mansfield Police Court on March 8th to answer charges of tampering with meters and fraudulently consuming electricity, the property of the Corporation.

In the first case it was stated that an inspector discovered that the seal of the meter at the defendant's premises had been broken and there were marks of burning on the armature disk. It appeared that the defendant had blocked the disk to prevent its rotating and registering the consumption of energy.

The magistrates said they had decided to deal leniently with the defendant. The charge of injuring the meter would be dismissed on payment of costs, but for preventing the meter from registering a fine of 10s. 6d. would be imposed.

Eight precisely similar cases were dealt with in the same way.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Motor Users and the Frequency Change.

With reference to Mr. Windibank's reply to "H" in the issue of the Electrical Review for March 7th, it is surely a pity to scrap perfectly sound motors as appears to be the case. One is compelled to wonder now if the 25-cycle machines, which are doomed to the "scrap-heap," will receive the same care in their manufacture as those that will be called upon to do their duty for many years.

Motor makers' guarantees have been greatly increased during recent years, even to the extent of an unlimited period I fancy, but we cannot think that the makers have or will become entirely philanthropic societies, however keen competition may be.

After all, can any firm, however large, afford entirely to scrap returned goods that are quite sound?

Bee.

March 8th, 1930.

It would be interesting to know if the part exchange scheme is a profitable one. If it is, then Mr. T. H. Windibank's reply to "H" will leave motor users with the impression that they are being grossly overcharged for 25-cycle motors.

It would be a sheer gamble to look for any benefit from a reduction in the cost of raw material and labour during the period of the frequency change, and, after taking into consideration the labour expended on the returned motor, the scrap value would not be very high.

It seems hardly feasible to give a brand new 50-cycle motor—electrically and mechanically interchangeable—for approximately 50 per cent. of the original cost of the 25-cycle motor, no matter what the age of the latter, and presumably the replace machine bears the maker's guarantee.

One can only wonder who the fairy godmother is—for it is difficult to believe that more efficient methods of manufacture will alone account for the vast difference between the initial and exchange prices.

Higgs Motors,

S. J. J. Vaughton, *Sales Manager.*

High Power Arc Rectifiers.

Mr. J. C. Read, in his paper on the above subject recently read before the Rugby Engineering Society and abstracted in your issue of the 28th ult., lays proper stress on the striking technical progress made during the last few years with the steel cylinder arc rectifier. But he states that this type of converting plant "is not at present able to invade seriously the field of power and lighting plant at 400 to 500 volts." In our opinion this hardly does justice to the position, for, so far as Brown Boveri rectifiers are concerned, the last return

we have (September, 1929) gives the following figures to the nearest 1,000 kW :—

Total output of steel cylinder rectifiers for 500 volts or less	422,000 kW
Ditto between 500 and 1,000 volts	378,000 kW
Ditto above 1,000 volts	200,000 kW

Incidentally, the first rectifier equipment to be ordered from the Bruce Peebles Company (licensees in Great Britain for our rectifiers) is a 1,500-kW unit at 550 volts.

British Brown-Boveri, Limited,
C. D. WALE, *Secretary.*

London, S.W.1, *March 10th*, 1930.

The Efficiency of Conversion.

As your correspondent "Weoley," writing in the issue of the ELECTRICAL REVIEW for February 28th, asks for efficiencies of converting plant, the following information may be of use to him :—

Particulars of plant : four Peebles-La Cour convertors.
Total capacity : 1,800 kW.

Two of these machines are well over 20 years old.

Efficiency is calculated by comparison of the kWh meters on the input and output sides.

Input voltage : 6,600 volts per phase, three-phase.
Output voltage : 460-550 d.c.
Running load factor—about 43 per cent.

Average annual efficiency obtained :—1926, 87.2 per cent.; 1927, 87 per cent.; 1928, 88.5 per cent.; 1929, 87.18 per cent.

The accuracy of the metering is demonstrated by the consistency of the efficiencies obtained on the individual machines.

Corney.

March 18th, 1930.

The City and Guilds Examinations.

I shall be greatly indebted to Mr. J. Peake Sexton if he will answer the following questions :—

(1) Is it compulsory for anyone taking the examination in electrical installation work to attend a registered evening class?

(2) What procedure does he recommend to the wireman living in a district where no classes are held?

I will welcome the day when the wireman will compulsorily produce his certificate; this may eliminate the shoddy installation and enable him to merit a living wage.

H. W. Nelson.

Sidmouth, *March 7th*, 1930.

Relative Costs of Electricity and Gas.

"Arguer's" question is so worded as to be rather like the old poser "Have you left off beating your wife? Answer 'Yes' or 'No.'"

I would merely remind him that, according to official figures, more than 1,100 users of gas committed suicide last year.

Self-evident.

March 10th, 1930.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1928.

22,813. "Selective relays for the protection of electric circuits." Akt. Ges. Brown, Boveri et Cie. August 15th, 1927. (295,634.)

23,076. "High-frequency electric signalling systems." J. Robinson. August 10th, 1928. (325,232.)

23,148. "Electric batteries and electrodes therefor." C. H. Everett and G. R. Carr. January 4th, 1928. (303,472.)

26,222. "Conductors for electricity." A. H. Seabrook and A. Avis. September 12th, 1928. (Cognate application, 4,180/29.) (325,248.)

29,034. "Thermionic valves." H. J. Küchenmeister. October 9th, 1928. (Convention date not granted.) (298,638.)

29,320. "Electric battery-charging systems." A. H. Midgley. October 11th, 1928. (325,191.)

32,599. "Method of manufacture of insulated electric cables." J. E. Allan and S. B. Freeman. November 8th, 1928. (Cognate application, 27,230/29.) (325,210.)

32,839. "Crystal receivers for radio-telephony and telegraphy." D. Cronsier. November 9th, 1928. (Convention date not granted.) (300,280.)

32,904. "Magnetic arc blow-outs." English Electric Co., Ltd., and T. Zweigbergk. November 10th, 1928. (325,203.)

32,931. "Manufacture of liquid or solid products by gaseous reaction under the influence of silent electrical discharge." I. G. Farbenindustrie Akt. Ges. November 11th, 1927. (Addition to 304,623.) (300,282.)

33,025. "Electric switches with oil-immersed contacts." Siemens-Schuckertwerke Akt. Ges. December 2nd, 1927. (301,493.)

33,048. "Telephone systems." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). November 12th, 1928. (325,214.)

33,063. "Electric heating apparatus for liquids." H. H. Henning. November 12th, 1928. (325,258.)

33,066. "Electro acoustic devices, such as loud-speakers." British Thomson-Houston Co., Ltd., and F. G. Arkell. November 12th, 1928. (325,227.)

33,113. "Telephone systems." Associated Telephone and Telegraph Co. December 2nd, 1927. (301,495.)

33,383. "Dispatching systems for elevators, hoists, and the like." Associated Electrical Industries, Ltd. (Westinghouse Electric and Manufacturing Co.). November 14th, 1928. (325,241.)

33,481. "Power systems." E. M. Johnson, H. C. Pierson, and Associated Electrical Industries, Ltd. November 15th, 1928. (325,269.)

33,482. "Electrical indicating measuring relay and like arrangements responsive to frequency." B. A. G. Churcher and Associated Electrical Industries, Ltd. November 15th, 1928. (325,270.)

33,512. "Telephone systems." Burovox, Ltd., and S. C. Winfield-Smith. November 15th, 1928. **(325,274.)**

33,517. "Frequency-control methods and systems." Electrical Research Products, Inc. February 24th, 1928. (306,525.)

33,641. "Insulated electrical conductors." Standard Telephones and Cables, Ltd., and W. K. Weston. November 16th, 1928. (325,279.)

33,644. "Toll-switching trunk circuits for telephone exchange systems." Standard Telephones and Cables, Ltd. (F. A. Roome). November 16th, 1928. (325,280.)

33,738. "Fusible cut-outs for electric circuits." W. T. Henley's Telegraph Works Co., Ltd., and P. Dunsheath. November 17th, 1928. (325,285.)

33,750. "Brushes for use in dynamo-electric machines, electric motors, and the like, and processes for the manufacture thereof." Morgan Crucible Co., Ltd., and J. E. Grant. November 17th, 1928. (325,287.)

33,772. "Electric transformers." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). November 17th, 1928. (325,288.)

33,802. "Lightning or surge arrestors." British Thomson-Houston Co., Ltd., and H. S. Holbrook. November 17th, 1928. (325,289.)

33,810. "Vacuum electric tube devices." E. Y. Robinson and Associated Electrical Industries, Ltd. November 17th, 1928. (325,291.)

34,841. "Tuning devices for radio apparatus." T. A. W. Robinson. November 26th, 1928. (325,310.)

34,844. "Electric braking and control of vehicles." Tilling-Stevens Motors, Ltd., and H. K. Whitehorn. November 26th, 1928. (325,311.)

35,259. "Mechanism for feeding electrodes in automatic or semi-automatic arc-welding machines." British Thomson-Houston Co., Ltd. November 29th, 1927. (301,434.)

35,612. "Contactors." British Thomson-Houston Co., Ltd. December 1st, 1927. (301,743.)

35,731. "Cathodes for thermionic devices." P. Freedman. December 4th, 1928. (Cognate application, 26,243/29.) (325,317.)

36,445. "Radio and the like communication systems." Marconi's Wireless Telegraph Co., Ltd. December 8th, 1927. (302,179.)

37,042. "Electric pick-up devices for gramophones and the like." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). December 14th, 1928. (325,329.)

37,187. "Electric switches." R. Bosch Akt. Ges. December 17th, 1927. (302,590.)

37,732. "Electrical branding devices." W. C. Haynes. December 21st, 1928. (325,334.)

1929.

179. "Process for the manufacture of porous bodies, more particularly for electro-osmotic purposes." Siemens & Halske Akt. Ges. January 28th, 1928. (305,020.)

1,318. "Electromagnetic sound reproducer." Brandes, Ltd. (Brandes Laboratories, Inc.). January 14th, 1929. (325,354.)

1,351. "Electrically-controlled transmission device specially suitable for order telegraphs." Soc. d'Etude et de Construction d'Appareils de Télémécanique. January 14th, 1928. (304,153.)

2,449. "Television and like apparatus." R. L. Aspden. January 24th, 1929. (325,362.)

3,491. "Concordance-restoring device for electric distant control systems." E. Granat and Compagnie des Forges et Aciéries de la Marine et d'Homecourt. March 30th, 1928. (Addition to 300,608.) (308,779.)

3,715. "Spark plug." A. C. Spark Plug Co. March 19th, 1928. (308,203.)

5,369. "Radio-communication systems." J. Carpentier Ateliers. February 17th, 1928. (306,405.)

5,533. "Producing insulating masses of high disruptive strength." Siemens and Halske Akt. Ges. February 27th, 1928. (306,900.)

5,747. "Automatic and semi-automatic telephone systems." Standard Telephones and Cables, Ltd., and J. H. E. Baker. February 21st, 1929. (325,392.)

6,974. "Electrical separation of rubber from rubber latex." Siemens and Halske Akt. Ges. March 12th, 1928. (307,747.)

6,983. "Electrical separation of rubber from rubber latex." Siemens and Halske Akt. Ges. November 10th, 1928. (Addition to 307,747.) (325,401.)

7,038. "Electric motor control systems." American Laundry Machinery Co. December 17th, 1928. (325,402.)

7,314. "Radio-communication systems." M. De Saivre. April 3rd, 1928. (309,022.)

8,580. "Sparking plug electrodes." Soc. de Construction d'Appareils Mécaniques et Electriques pour Automobiles. March 16th, 1928. (307,941.)

9,630. "Oscillation, generating and modulating systems." Marconi's Wireless Telegraph Co., Ltd. March 23rd, 1928. (308,663.)

11,141. "Windings for transformers, reactors, and other inductive apparatus." British Thomson-Houston Co., Ltd. April 13th, 1928. (309,596.)

11,597. "Coupling devices for use in high-frequency circuits." Marconi's Wireless Telegraph Co., Ltd. April 14th, 1928. (309,833.)

13,828. "Cooling of high-frequency electrical apparatus." C. Lorenz Akt. Ges. May 5th, 1928. (Addition to 258,610.) (310,969.)

18,742. "Battery hand lamps." Burgess Battery Co. June 19th, 1928. (313,925.)

21,092. "Lead-sheathed electric cables." Siemens Schuckertwerke Akt. Ges. July 10th, 1928. (315,273.)

32,847. "Receptacles for use in the electric heating of liquids." H. H. Henning. November 12th, 1928. (Divided application on 325,258.) (325,293.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 5th :—

Diolite. No. 505,146. Class 6. Electrical machinery and parts thereof. No. 505,147 Class 13. Electric lamps (ordinary), electric light fittings, sparking plugs, &c.—General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Volex. No. 500,577. Class 8. Electric dry cells, batteries and accumulators (not for medical purposes).—Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester.

Tridurite. No. 500,911. Class 8. Insulated electric cables.—British Insulated Cables, Ltd., Prescot, Lancs.

Time-O-Stat (lettering and design). No. 504,961. Class 8. Automatically-controlled devices for electric refrigerators, automatic circuit breakers, &c.—Time-O-Stat Controls Co., Elkhart, Ind., U.S.A. (British representatives : Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.).

Rex. No. 507,801. Class 8. Electricity meters.—Société de Compteurs de Genève, Geneva. (British representatives : G. F. Redfern & Co., 15, South Street, E.C.2.)

Liver. No. 508,129. Class 8. Philosophical and scientific instruments and apparatus for useful purposes. No. 508,136. Class 50. Electric lighting, heating, telephonic, telegraphic, radio-telephonic and telegraphic and television fittings.—Liverpool Electric Cable Co., Ltd., Linacre Lane, Bootle, Lancs.

Tiltatone. No. 508,791. Class 8. Instruments and apparatus for radio-signalling, sound reproduction, and thermionic amplifiers, &c.—Celestion, Ltd., London Road, Kingston-on-Thames.

Fotos. No. 509,331. Class 8. Parts of radio-telephonic apparatus.—Concerton Radio and Electrical Co., Ltd., 256-7, Bank Chambers, 329, High Holborn, W.C.1.

Franklin. No. 509,558. Class 8. Apparatus for use in radio-telegraphy or telephony.—Ethel W. Johnston, 43, Cleveland Road, Ilford.

BerCo (lettering and design). No. 509,676. Class 8. Electrical resistances, measuring instruments, relays and automatic electric switches.—British Electric Resistance Co., Queensway, Ponders End, Middlesex.

Golden Flame No. 509,725. Electric batteries (not for medical purposes).—S. Kalisky (Aldgate), Ltd., 75, High Street, Aldgate, E.C.3.

Feno. No. 502,862. Class 18. Electric fires.—Johannes Schleper, trading as J. Schleper & Zonen, Amsterdam. (British representative : J. Ellam, 49, Gartside Street, Manchester.)

Hercules. No. 505,855. Class 18. Lighting installations.—Dualite, Ltd., 52-53, Fetter Lane, E.C.4.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALTON (Hants.).—Houses (248), for the U.D.C.; surveyor.

ASHFORD (Kent).—Housing scheme (66), for the U.D.C.; William Bowles, architect, 16, Church Road (returnable deposit of £2 2s.).

AYRSHIRE.—Reconstruction of Victoria Hotel, Largs; the proprietor.

BANBURY.—Works (£250,000) electrically equipped, for the Northern Aluminium Co.; R. D. Palmer, local superintendent.

BECKENHAM.—Maternity home extensions, for the U.D.C.; surveyor. School (500 places), for the E.C.; T. W. Astbury, acting clerk.

BECKERMET (Whitehaven).—Electric lighting installation, reading rooms; secretary.

BILSTON.—Additional 600 houses, for the U.D.C.; surveyor.

BIRKENHEAD.—Development of Arrowe Park (£37,500); reconstruction, New Ferry depôt (£16,000); borough engineer.

BRIDLINGTON.—Waterworks; borough surveyor.

BRIGHOUSE.—Employment exchange; Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1 (deposit £1 1s.).

BROMLEY (Kent).—Laundry, with equipment (£20,000), for the Board of Guardians; Danby Smith, architect.

BURNLEY.—Baths; borough surveyor.

CANNOCK.—Library and extensions to public offices, for the U.D.C.; surveyor.

CARLISLE.—Cinema theatre, Warwick Road, for Sidney Bacon's Pictures, Ltd.

CHELTENHAM.—Medical and swimming baths (£50,000), for the T.C.; borough surveyor.

CHURCH GRESLEY.—School (400 places), for Derbyshire E.C.; H. W. Skinner, clerk, Derby.

CLYDEBANK.—Houses (320), for T.C.; burgh surveyor.

COVENTRY.—Houses (22), Allesley; Gazey Bros., builders, Corley, Coventry.

DARWEN.—School, Manor Road; secretary to the E.C.

DURHAM.—County offices, Old Elvet; County Council.

EDINBURGH.—Houses (67), Craigleith Crescent and Belmont View; J. Millar & Sons, builders, Millar Place, Morningside.

FORT WILLIAM.—School (£20,000); George Stewart, building contractor, Blantyre.

GLASGOW.—Houses (1,372), Croftfoot estate; Western Heritable Investment Co., Ltd. Houses (174), for the Corporation Housing Department; the architect. Shops, Lomax Street, Riddrie; Glasgow Eastern Co-operative Society, Ltd. Church and manse at Knightswood (£16,000); H. C. Sloan. Reconstruction of Lennox Castle as mental hospital; clerk, Parish Council.

GOOLE.—Houses (100), for Pease & Partners, Thorne Colliery; Housing Corporation of Great Britain, Ltd.

HATFIELD.—Aerodrome, for the de Havilland Aircraft Co., Ltd., Stag Lane, Edgware.

HAVERFORDWEST.—Municipal offices, Market Street (£7,500); H. H. Hole, architect, Council Chambers, St. Mary Street.

HESTON AND ISLEWORTH.—Houses, Heston Housing estate (216) and Woodlands estate (44); R. T. Warren. Houses (36), Beavers Lane and Manor House estate; P. Chase Gardener & Co., architects. Houses (39), various sites; P. Chase Gardener & Co., 87, Uxbridge Road, Hanwell, W. Six shops with flats over, Kingsley Road; G. Whittaker, architect, 13, Queen Street, S.W.1.

HORNCHURCH.—School extensions (£20,399), for Essex E.C.; J. Stuart, county architect, Chelmsford.

HULL.—Improvements, Royal Station Hotel, for L.N.E.R. Telephone exchange, Hedon; city architect.

INVERNESS.—School at Mallaig, for Inverness Education Authority (£20,000); Geo. Stewart, building contractor, Blantyre.

IRISH FREE STATE (Cork).—Bakehouse and stores, Canwell Road, for the Cork Co-operative Society; James F. McMullen, architect, 30, South Mall (returnable deposit of £3).

KIRKCALDY.—Houses (120), for Corporation; George Duffus, burgh surveyor.

LANCASTER.—Library, Market Square (£14,300); borough engineer.

LEEDS.—Houses (262) Meanwood and Westfield estates; W. Thompson & Sons. Conversion of premises, Domestic Street into cinema; F. Mitchell & Son, architects, 9, Upper Fountaine Street, Albion Street.

LEXDEN AND WINSTREE (Essex).—Additional 100 houses, for the R.D.C.; surveyor.

LONDON (Ilford, E.).—Houses (454) and shops (26), Aldborough Grange estate; Suburban Developments, Ltd. Houses (101), Southbourne and Loxford Gardens; T. B. Goodwin. Houses (54), Collinwood Gardens; A. Smith. Houses (44), Rosemary Drive; P. G. Ashton & Sons. Eight shops and houses, Green Lane, for J. E. Neal; Mr. Aldridge. Extensions, maternity home (£40,000), for the T.C.; borough surveyor.

(Lewisham, S.E.).—Flats (60), with electric lighting work, Lower Sydenham, for the T.C.; borough surveyor, Town Hall. Shops and offices, for the T.C.; Bradshaw, Gass and Hope, architects, 19, Silverwell Street, Bolton (returnable deposit of £2 2s.).

(Greenwich, S.E.).—Dwellings, Highes Fields (£20,918); Unit Construction Co., Ltd.

MAIDSTONE.—Houses (66), Mote Park estate, for the T.C.; East Kent Building Co., Folkestone, builders.

MANCHESTER.—School, Briscoe Lane, Newton Heath, and extension of Old Moat School, Hough Road, Withington (700 extra places); S. Hey, director of education, Education Offices, Deansgate.

MIDDLESBROUGH.—R.C. church, Linthorpe Road; rural dean.

MIDDLESEX.—New schools (£954,500), for the E.C.; director of education, Westminster.

MYTHOLMROYD (Yorks.).—Houses (50); Ellis Watson.

NEWCASTLE-ON-TYNE.—Town hall; city architect.

NEWHAVEN.—Telephone exchange, High Street, for H.M. Office of Works, King Charles Street, London, S.W.

PAIGNTON.—Re-erection of Commercial Hotel, for Simmonds & Co., Ltd., Reading (£20,000).

PENZANCE.—Houses (58), for the T.C.; F. Latham, borough engineer and surveyor, Municipal Buildings.

PRESTON.—R.C. church, Fishwick; R. Mercer, architect, 11, Chapel Street.

PURLEY.—Offices and factory; F. Sutton Smith, architect, 7, Ross Parade, Ross Road, Wallington.

ROCHESTER.—Senior school (500 places), Strood, for the City E.C.; director of education.

ROMFORD.—Rebuilding station, &c. (£250,000); Robert McAlpine & Co., Ltd., contractors.

SALFORD.—New block at Royal Hospital; secretary.

SALISBURY.—School (400 places), for the City E.C.; A. Smart, clerk.

SANQUHAR.—Restoration of Sanquhar Church (with electric lighting) (£10,000); Rev. W. S. Buchan.

SHEPSHED.—Housing scheme (78), for the U.D.C.; McCarthy, Collings & Co., architects, Central Chambers, Coalville (returnable deposit of £3 3s.).

SMETHWICK.—Reconstruction of Princess Hall Cinema, High Street; E. Hewitson.

SOUTHPORT.—Covered market (£14,000); borough surveyor.

STROUD (Glos.).—Housing scheme (31), for the U.D.C.; F. S. Cutler, surveyor (returnable deposit of £5).

SURREY.—Schools, Worcester Park and Tolworth, for Surrey E.C.; W. W. Finny, secretary, Kingston-on-Thames.

SUTTON-IN-ASHFIELD.—Housing scheme (42), for the U.D.C.; Warner & Dean, architects, Mansfield Road (returnable deposit of £3 3s.).

SUTTON (Surrey).—Houses (84), St. Helier estate, for the L.C.C.

TWICKENHAM.—Isolation hospital extensions, for the T.C.; Gilbert R. King, borough engineer (returnable deposit of £1 1s.).

WARWICK.—Further extensions of county offices (£13,500); county architect.

WELLINGBOROUGH.—Housing scheme (50), Croyland Road estate, for the U.D.C.; surveyor (returnable deposit of £1 1s.).

WELWYN GARDEN CITY.—Houses (200), for the U.D.C.; Hufton & Co., builders. Works, for the Norton Grinding Wheel Co., of Worcester, Mass., U.S.A.

WEST RIDING.—Schools, Bolton-on-Dearne (£44,500), Normanton (£16,970), Skelmanthorpe (£24,500), and South Hiendley, Barnsley (£14,400); director of education, Wakefield.

WEYMOUTH.—Central stores, offices, and showrooms, for the Co-operative Society; A. P. Burt, secretary.

YORK.—Houses (100), Burton Stone estate; city engineer. Factory, Hull Road; P. Lazenby.